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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

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Indexes for the previous 6 months will be found in the First number of July and the First number of January.

Books.—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. We would suggest to our patrons that to avoid the risk and expense consequent on sending us the money (we do not send books C. O. D.), that orders for books be sent us through the Purchasing Department of the American Express Company.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

American Gas Institute Invited to Attend the Illinois Gas Association Meeting.

AMERICAN GAS INSTITUTE, OFFICE OF PRESIDENT,
31 NASSAU ST., NEW YORK, March 13, 1908.

To the Members of the American Gas Institute: I take pleasure in notifying the members that a very cordial invitation has been extended to the officers and members of the Institute to attend the annual meeting of the Illinois Gas Association, to be held in Chicago, March 25th and 26th.

A. C. HUMPHREYS, President.

[OFFICIAL NOTICE.]

Fourth Annual Meeting, Illinois Gas Association.

OFFICE OF THE SECRETARY,
EAST ST. LOUIS, ILLS., March 12, 1908.

The fourth annual meeting of the Illinois Gas Association will be held in Chicago, Wednesday and Thursday, March 25th and 26th.

The Auditorium Hotel, which has been selected as headquarters, announces the following rates:

Single room, without bath.....	$2	and upwards.
Double room, "	3	"
Single room, with bath.....	3	"
Double room, "	4	"

The many good hotels in the vicinity of headquarters assure the members in attendance of the best accommodations.

The following papers have been arranged for presentation at this meeting:

"New Business Methods," by Mr. C. H. Sidenglanz, Rockford, Ills.

"Retort House Practice," by Mr. W. E. Hartman, Aurora, Ills.

"Office Methods," by Mr. W. J. Achelpohl, Ottawa, Ills.

"Meter Repair Shop Practice," by Mr. C. L. Day, Chicago, Ills.

"The Point of View in Advertising Gas," by Mr. D. McJunkin, Chicago, Ills.

It will be seen that the practical idea has not been lost sight of in the subjects. Each paper will follow the subject "from the ground up," in a manner similar to Mr. Battin's treatment of "Water Gas Practice" at the Peoria meeting.

The Committee on Arrangements and Entertainment have not definitely decided on their plans, but the members may be assured that everything will be carefully planned for their comfort and pleasure.

The Executive Committee feels that, in the programme presented for this meeting, it has provided the material for as interesting and instructive a meeting as was ever held in an Association of this kind, and that the record meeting of the Illinois Gas Association is assured.

The Peoria meeting was one to be proud of, and for the Chicago meeting let every member plan to be in attendance, ready to do his share to make the 1908 meeting an enthusiastic, record-breaking success.

LIBRARY OF CONGRESS. MAR 23 1908 SMITHSONIAN DEPOSIT.

Will you kindly forward to the Secretary at once any questions that you wish to have answered, or any suggestions in regard to the meeting?

Decide to-day not to miss it then reserve your hotel accommodations. Applications may be had of the Secretary. *Boost* the membership.

C. H. QUACKENBUSH, Secretary.

BRIEFLY TOLD.

THE FOURTH ANNUAL MEETING OF THE ILLINOIS GAS ASSOCIATION.—The current official notice of Secretary Quackenbush, respecting the meeting in Chicago this week of the Illinois Gas Association, leaves little to be said in the matter of preliminaries. From these, as put forward by him, one would be a poor prognosticator who ventured the opinion that the meeting is not to be a thoroughly good one in every respect. In any event, it is certain that the executives have done their part well in arranging for the sessions, and the best reward that can come to them in return for their activity is an attendance exceeding that of the former sessions of this go-ahead Association. The social arrangements have been planned on a scale commensurate with the thought or knowledge that the attendance will be large. These include a banquet, to be spread in the Auditorium new hall the evening of the 26th. In accordance with the resolution adopted at the last meeting, all entertainment now and hereafter is to be paid for out of a contribution from those who share therein. The estimate for this year's entertaining is put at the reasonable sum of $5 per likely attendant, and those who assent can, to a certainty, to use the homely phrase of this and other times, surely count on having their money's worth. Another important thing that is to engage the attention of the Association relates to a rearrangement of its membership divisions. Perhaps this can be best explained by quoting from Secretary Quackenbush's circular, dated the 7th inst.: "* * * At this meeting there will be introduced, for the vote of the Association, a resolution providing a new class of membership in the Association for men engaged in gas engineering consulting work, with headquarters in the territory covered by the Association, and such men in the gas supply industry doing business in the territory covered by the Association. Heretofore membership has been vested in the gas companies and their officers in the State of Illinois. The resolution as proposed will allow a membership in the Association for those men who are so closely allied with the present membership of the Association, and so necessary to the success of the gas industry."

TWO EXCELLENT SECTION MEETINGS OF THE ILLUMINATING ENGINEERING SOCIETY.—Two more excellent sessions of this Society have been held the current month. The first was that of the New York Section, which was held in the United Engineering Societies' Building the night of the 12th. The paper was by Mr. E. L. Elliott, whose comments on "The Relation of Illuminating Engineering to Architecture from the Engineer's Standpoint," were quite to the point—most of Mr. Elliott's ways of putting matters are usually so. This paper was in reality supplementary of one submitted at the December meeting. There can be little doubt that the divergence of opinion on the matters discussed will for a long time be marked as between architects and illuminers; but it is well to know that a beginning, and a good one, is on for the defining of the relative status. Mr. Elliott's paper is surely a practical one. The attendance at the session was more than fair and the discussion was brisker than it was prolonged.

The meeting of the New England Section of the Society was held in the Auditorium of the Edison Building, Boylston street, Boston, the evening of the 17th, with a good attendance despite the weather. Doctor Myles Standish was the speaker of the evening, and he discoursed with much freedom and a volume of originality on "Artificial Illumination from a Physiological Point of View." Of course his views were differed with by many, but in the main he rather fully held his own in the discussion. The vote upon the proposition to change the meeting time to a positively fixed day was taken, but we have not been advised of the official count. However, the only difference that existed was as to whether or not the second Tuesday of each month should be named, or the third Tuesday.

CURRENT COMMENT.—

THE Brown Hoisting Machinery Company, of Cleveland, O., has just sent ont a beautifully-gotten up circular-pamphlet descriptive of the "Brownhoist" locomotive cranes, which are fitted out with the Brown patent grab buckets for handling coal, coke ashes, and the like. Write to them for a copy of it and we will guarantee that you will examine it carefully and then file it where it may easily be referred to.

THE comparative statement of sendout, for February last as compared with February, 1907, compiled by the Child-Hulswit Company, and referring to seven of its gas properties, shows a good gain all along the line. The gain, however, in one of them (Chattanooga) is really marvellous, in that it figures out at virtually 26½ per cent. Surely, that reveals good management.

THE American Society of Mechanical Engineers, having determined to enlarge and develop the scope and way of its printed publications, is to be congratulated on having secured the services of Mr. Lester G. French, well known to the literary world from his long service on the editorial staff of "Machinery."

AT a meeting of the Executive Committee of the Southwestern Electrical and Gas Association, held in Dallas, Tex., the 4th inst., it was ordered that the next meeting of the Association should be held in El Paso, May 7, 8 and 9. It was also decided to select the Hotel St. Regis as headquarters. We shall give all the preliminaries in proper time.

Minutes to the Memory of Dr. Wilkinson, Adopted by the Society of Gas Lighting.

The following resolutions respecting the late Dr. Wilkinson were passed at the last regular meeting of the Society of Gas Lighting:

To the Society of Gas Lighting:

We, your Committee, appointed at the last regular meeting of the Society to report on the demise of our old and valued associate and friend, Dr. Asa Williams Wilkinson, beg to submit the following report:

He died suddenly, from acute indigestion, at the Hoffman House, New York city, at 5:30 P.M. Saturday, January 25th. The Doctor was a descendant of John Hopkins and Asa Williams, both of whom were well-known and prominent in the early history of our country.

He was born near Cayuga Lake, N. Y., in 1833, his parents immigrating at that time from Rhode Island. In early life he studied medicine with a country doctor, and afterward studied at Brown University, and later graduated from the New York Medical College, taking his degree in 1855. He then became an interne at the City Hospital, Blackwell's Island, New York, going from there to Randall's Island, to assume medical charge of the juvenile wards. He left there to establish an oil of vitriol factory at Buffalo, N. Y., but soon returned to become an assistant to Prof. R. Ogden Doremus, at the New York Medical College.

In 1860, when Bellevue Medical College was established, he was prominent in designing the buildings and in the general arrangement of the classes and apparatus. In 1866 he accepted a call as Assistant to Prof. Doremus, at the College of the City of New York and retained that position for 20 years.

In 1866 Dr. Wilkinson became interested in the manufacture of oxygen gas and made improvements in the carburetting of illuminating gas, enabling it to be burned in conjunction with the oxygen fed by a separate pipe to the burner. Later he conducte d the chemical engineering of carburetted water gas manufacture, which was introduced into this country by M. Tessie du Motay. In the early eighties he became chemist for the New York Mutual Gas Light Company, which position he held to the time of his death. In the nineties he was appointed chemist to the Equitable Gas Light Company, of New York city, and held that position until the consolidation of the City Companies. During his connection with the Mutual Company he obtained patents for manufacturing gas from wood, which process was used for several years. Later he took out numerous patents for manufacturing carburetted water gas.

It is owing largely to the Wilkinson process that the Mutual Company is in so prosperous condition to-day. He was a man well versed in matters of the day, an unusually interesting and instructive conversationalist, and of a gentle and pleasant personality. He will be missed by his associates both here and elsewhere.

WALTER A. ALLEN,
ARTHUR H. ELLIOTT,
E. G. LOVE,
} Committee

Manufacture of Gas for Balloons.

[A paper prepared and read by MR. H. C. CRAFTS, at the Thirty-eighth Meeting, New England Association of Gas Engineers.]

From an early period in the history of the gas industry it has been the custom of local plants to supply gas at occasional intervals for the inflation of balloons for exhibition purposes, the gas supplied under these conditions being the same as that furnished for general consumption and usually without special preparation for the particular use for which it was required.

Within the past 2 or 3 years, however, the activity that has been shown by inventors in their attempts to produce an air ship for aerial navigation, the experiments of scientists upon meteorological phenomena, the formation of Aero Clubs both in this country and abroad, and the advent of ballooning as a distinct sport have combined to increase the interest in ascensions of this nature to a marked degree. During this time a large number, probably the majority, of ascensions that have taken place in New England, have been made from Pittsfield, and as a specially prepared gas has been furnished for the purpose, a brief statement of the arrangements which we have for filling the balloons and the methods used in making the gas may be of some interest to the members of this Association.

The ascensions have been made under the auspices and authority of the Aero Club of America, whose rules require that all ascensions shall be conducted by duly licensed pilots of the Club—the license being issued only after satisfactory proof has been given of ability to manage a balloon and not until at least 10 ascensions have been made, one of these alone and one at night.

The balloons used have varied in size from the smallest, with a capacity of 18,000 cubic feet and carrying one passenger, to the largest, holding 77,000 cubic feet; this latter, the "All-America," making an ascension on November 26, 1907, with 7 passengers and landing near Concord, N. H., a distance by air line of about 150 miles.

The balloons are usually round in shape, made of cotton, linen or silk material and constructed from comparatively small pieces stitched together with seams running both vertically and horizontally, the whole being treated and heavily coated with special varnishes making them practically gas tight. When finished, two circular openings are left, one at the extreme top and one at the bottom, the latter being used to make the connection for filling, while to the upper opening is attached the valve from which the gas is released when necessary. This valve is a ring of wood with two semi-circular doors opening into the balloon and held closed with heavy elastic cords which pass to the top of a framework above the valve; to the underside of these doors a cord is attached which passes down through the center of the balloon, through the lower opening and into the basket, from which point it is easily operated.

For emergency use a rip-cord is provided; when made, the balloon is split for a part of its length from the valve downward and resewed with an insert piece so arranged that a pull from its top by means of the rip-cord, which also runs to the basket, will cause the rip sheet to peel off inside, thus deflating the balloon very rapidly. This is only used in case of extreme need.

The balloon is spread out flat upon the field, valves and ropes carefully placed and adjusted and the envelope covered with a cordage netting, the upper portion having an opening so arranged that it will fit closely about the valve ring to which it is fastened by leather straps. This netting is shaped for the balloon, the lower portion being gradually gathered together and attached to heavier ropes called "leader cords," which in turn are to be fastened to a wooden ring from which the basket for the passengers is attached.

When everything is in readiness for filling, a large number of sand bags are attached to the netting by means of hooks with which the bags are provided and these are lowered from mesh to mesh in the netting as the balloon is gradually inflated. When entirely filled with gas, the balloon is allowed to rise a short distance from the ground, the basket is attached and bags filled with carefully screened sand are placed in the basket in excess of the amount that can actually be lifted; these are then removed one by one until the balloon is in an exact state of equilibrium when the removal of a very small additional amount will allow the whole to slowly rise. Our arrangements for filling balloons at Pittsfield are as follows:

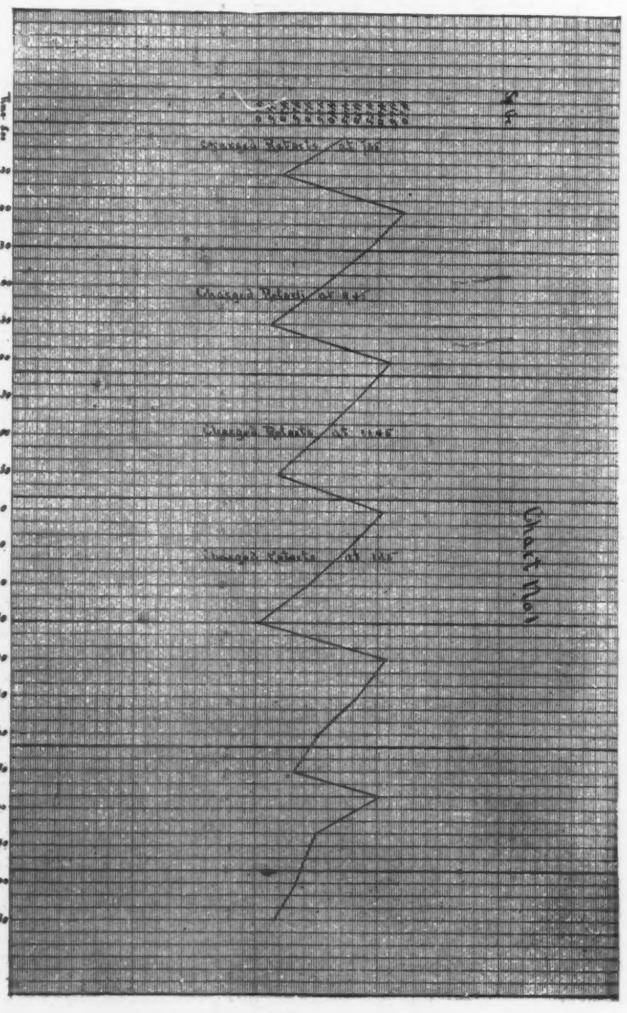
The balloon field, or "Aero Park" as it is called, is a large, level tract of land, adjacent to and a part of our works property; this field is located in close proximity to a holder of 125,000 feet capacity, ordinarily used as a water gas relief holder, but used at times of ascensions for the storage of balloon gas as made. From this holder an 8-inch pipe has been laid to a convenient point upon the field, the gas being controlled by a wheel valve at its extreme end, the connections between this pipe and the balloon being made by a flexible tube of about the same size.

This holder gives a pressure of about 4 inches and the actual delivery of gas is approximately 1,000 cubic feet per minute - no blower being used. For balloon purposes, the principal requirement in a gas is that it shall be as light as possible; namely, have a low specific gravity. Hydrogen gas with a specific gravity of .0692 is best adapted for this use, but on account of its expense and the difficulty of manufacture in large quantities is seldom used for balloons of this type. The gas supplied by local city plants for the purpose consists of a lean coal gas of low gravity.

At Pittsfield our usual commercial gas for general use is a mixture of coal and water gas, in the proportion of about ⅔ of the former to ⅓ of the latter—the specific gravity of this mixed gas averages about .530, while the component parts average about .665 for the water gas and about .460 for the coal gas. As compared with our total output, the amount of gas made for balloon purposes is very small, and for this reason, while special precautions are taken to insure a gas of suitable gravity, no radical changes in the usual method of manufacture can be made. Care is taken that the purifiers, meter, pipes and holder are thoroughly purged from water gas, the heats in the benches are carried as high as practicable, somewhat smaller charges than usual are made, and the period of carbonization increased from 4 hours to 5½ or 6 hours. The gas is thoroughly purified, the impurities in coal gas being all of a comparatively high gravity, and one of the purifiers is used as a lime box for the removal of carbonic acid.

Gravity observations at the outlet of the meter are taken and recorded every 30 minutes while the gas is being made, and observations of samples of the average gas in the holder are made at the time of filling the balloon from which the theoretical lifting power of the gas is deduced and compared with the weight actually lifted.

The reasons for these modifications in the usual method of manufacture are at once apparent. The increase of heat results in an in-



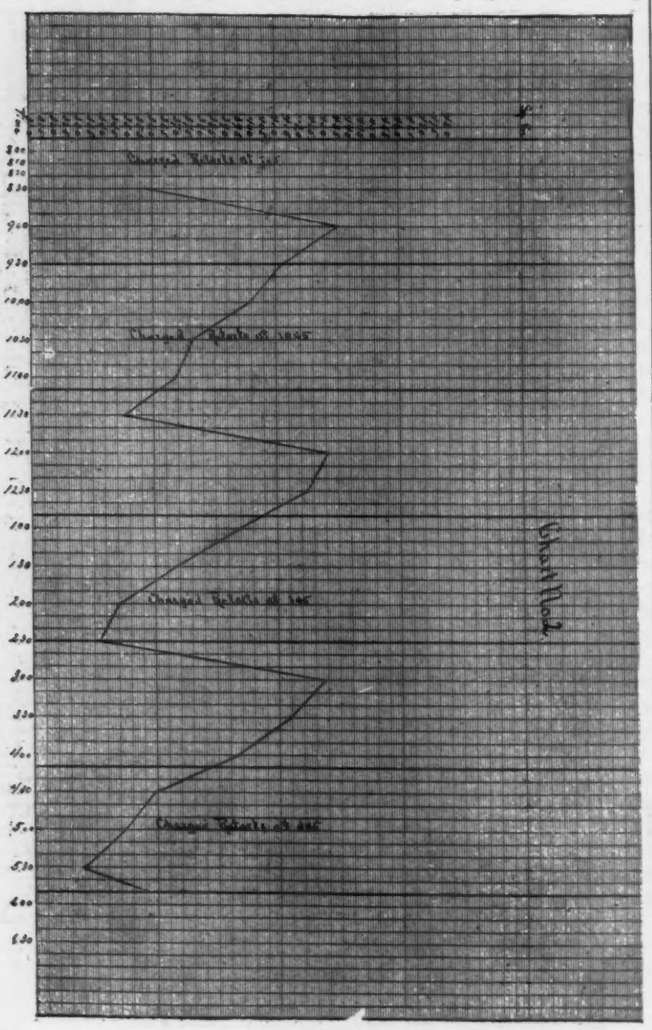
crease of gaseous products and a change in their character, the different products obtained at higher temperatures being the result of the further decomposition and splitting up of the primary products of the carbonization. As these gases pass through the surrounding mass of incandescent coke, and along the heated upper portion of the retort, they decompose in various ways, producing other hydrocarbons and free hydrogen, and depositing carbon on the walls of the retort and in the pores of the coke; the decrease in the size of charges making this decomposition more complete from the fact that the retorts are cooled to a lesser extent by the fresh charge and that a larger surface of the heated retort is presented to the gases evolved. The composition and gravity of the gas also vary greatly as the carbonization of the charge progresses and show a constant change from the beginning to the end of the carbonizing period.

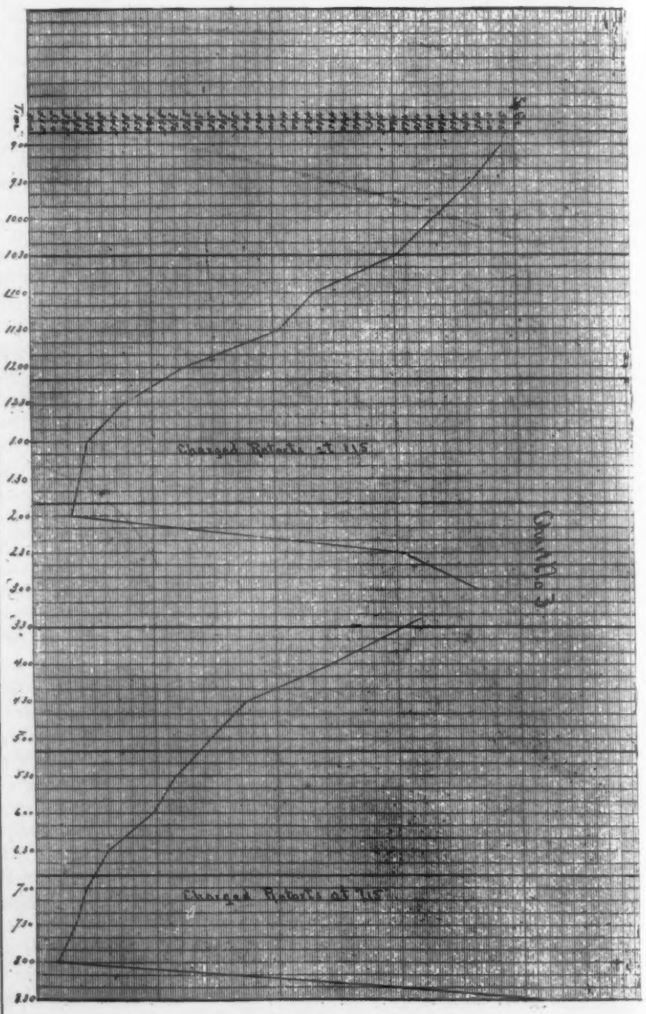
In connection with our manufacture of balloon gas, no analyses of the gas were made to determine these changes; but the following table, prepared by Charles Hunt in 1894, is of interest in this connection and is, therefore, given:

Time After Commencement of Carbonization.

	10 Minutes.	1 Hour, 30 Minutes.	3 Hours, 25 Minutes.	5 Hours, 35 Minutes.
Hydrogen	20.10	38.33	52.68	67.12
Methane	57.38	44.03	33.54	22.58
Hydrocarbons	10.62	5.98	3.04	1.79
Carbonic oxide	6.19	5.68	6.21	6.12
" acid	2.21	2 09	1.49	1.50
Sulphuretted hydrogen	1.30	1.42	0.49	0.11
Nitrogen	2.20	2.47	2.55	0.78
	100.00	100.00	100.00	100.00

From this table it will be seen that the proportion of hydrogen continually increases while that of the methane and other hydrocarbons continually decrease; the result being, as would be expected, a constant decrease in the specific gravity of the gas. The changes in the specific gravity of the gas are shown more clearly by the following





charts made from actual observation while balloon gas was being manufactured. These charts are made from a large number of observations and are selected as showing the results by three different modes of charging. The variation on Chart No. 1 being the regular 4-hour charge, one-half the retorts being charged every 2 hours, the fluctuations between the high and low points are comparatively small.

Chart No. 2 shows the variations with 6-hour charges, one-half the retorts being charged every 3 hours, and naturally causes a wider variation and a lower average gravity.

Chart No. 3 differs from the others in that all the retorts are charged together, or as rapidly as possible, and shows more clearly the actual changes which take place from the beginning to the end of the charge in each retort, and results in a wide variation, the beginning of the charge giving off gas with a specific gravity of .505 and constantly decreasing during the period of carbonization until at the end the gas has reached a specific gravity of .320.

It will be noted in all these charts that no manifest change in the gravity is noticed until some 45 or 50 minutes after the retorts have been charged, this being the time required for the gas to pass through the works to the outlet of the meter where the observations are made. The average gravity obtained from the results on Chart No. 1 was .432; on Chart No. 2, .397; on Chart No. 3, .417.

The lifting power of the gas is determined entirely by its specific gravity, or, in other words, by the comparative weight of the volume of gas required to fill the balloon and the weight of an equal volume of air. The balloon will be at equilibrium when its own weight, with all its appurtenances, passengers and ballast are equal to the volume of air displaced by it, and will rise when any of this weight is removed.

As illustrating this, the gas made by Chart No. 3 was used for an ascension of the balloon, "Stevens 21," which has an actual capacity of 36,300 cubic feet. One thousand cubic feet of air weighs 76,357 pounds, and 36,300 cubic feet of air weighs, therefore, 2,771 pounds. The same amount of gas with a specific gravity of .417 weighs, 1,155

pounds, and the difference between these, or 1,616 pounds, represents the theoretical lifting power or weight that can be carried, or upon a unit basis, a lifting power of 44.5 pounds per 1,000 feet. The actual weights taken at this ascension were:

Balloon, basket and apparatus	693 pounds.
Weight of passengers	376 "
Ballast, 13½ bags	544 "
	1,613 "

The Disposal of Coal Tar.

[A paper prepared by CARROLL MILLER, C.E., Pittsburgh, Pa., for the Thirty-eighth Annual Meeting, New England Association of Gas Engineers.]

The object of this article is to illustrate, in a condensed form, the value of tar as a by-product to both the gas and coke industries. The number of products which can be manufactured from coal tar, and the uses that may be made of them, being so numerous, the mentioning of a few of the most common will, I think, serve the purpose. A visit to the Connellsville coke region, where the enormous waste of by-products in the bee-hive ovens is forcibly brought to one's notice, first suggested the writing of this paper, as there is but little doubt of a plentiful market for gas and ammonia, but that for tar is questioned by many. The following would seem to show that there is an increasing demand for tar in this country:

TABLE I.—*Value of Crude Coal Tar and Pitch Imported into the United States.*[1]

1902	$86,000
1903	139,000
1904	83,000
1905	115,000
1906	97,000

From 50 per cent. to 70 per cent. of the above came from England and substantially all the remainder from Canada.

TABLE II.—*Value of Imports for Year Ending June* 30, 1906.[2]

Colors and dyes, and all preparations of coal tar, not medicinal	$6,928,000

Naphthaline and creosote are included in this classification. The larger proportion of the dyes, etc., is brought from Germany. These imports have been increasing for the past 5 years. The latest report, which I have, of the Department of Agriculture gives for the production for 1904 in United States.

TABLE III.

	Gallons.	Value.
Coal tar produced in gas works	67,515,000	$2,064,000
" " " " "	23,074,000	552,000
	90,589,000	$2,615,000

The demand for pitch and creosote, the largest products of distillation, seems to be increasing considerably; the former notably for briquette (patent fuel) making and the latter for preserving timber. When in Europe, during 1907, I was informed that the manufacture of briquettes is advancing rapidly. I noticed that many railways in France and Germany use this class of fuel. The growing demand for creosote may best be illustrated by quotations as below:

Mr. Henry Grinnell, Assistant Forest Inspector, says,[3] "The extraordinary increase in the use of the telephone and telegraph during the last few years, combined with the fast diminishing supply of timber used in pole-line construction, has led the telephone and telegraph companies to take great interest in experiments to find the best and most practical method for increasing the length of service of poles and cross-arms."

The same author says: "The scarcity of timber suitable for telephone and telegraph poles has of late assumed serious proportions. To the users of poles, therefore, the question of how best to meet this situation is of first importance. * * * There are needed each year more than 2,650,000 poles." (U. S. Forest Service, Circular 103.)

Messrs. A. L. Dean and Ernest Bateman, Experts, Forest Service, write: "Timber preservation is playing an increasingly important role in the conservation of our national forest resources, and on this account the preservation experiments conducted by the Forest Service are becoming a more and more important part of the work of the service." (U. S. Forest Service, Circular 80.)

According to the *Engineering News* (January 23, 1908) 102,834,040 ties were purchased in 1906 by electric and steam railways. Of this number only about 12 per cent. were treated.

Trautwine ("Engineer's Pocket Book") gives the life of untreated ties at from 5 to 9 years. He says that creosoted ties have remained sound after 22 years. Lunge ("Coal Tar and Ammonia"), writes; "Numerous specimens of creosoted timber which have been found to be perfectly sound after being used as railway sleepers, fencing, etc., for periods varying from 16 to 32 years. * * *."

The Department of Commerce and Labor states that 37,490,067,000 feet B. M. of lumber were handled by sawmills during 1906. By glancing at the above figures a fair idea may be had of the prospective demand for creosote, as this substance has proved to be the best for timber preserving, although crude tar is also successfully used. I have dwelt on this subject at some length for, aside from its interest to coal tar producers, it is of extreme importance to many other industries.

TABLE IV.—*Uses of Crude Tar.*

1, Paint; 2, fuel; 3, making and repairing roads; 4, preserving timber; 5, manufacture of roofing felt; 6, manufacture of lampblack; 7, gas making.

Distilling.—As the subject of distilling and refining tar is an extremely broad and lengthy one, I can here only touch on generalities and will include but one purified product - naphthaline.

TABLE V.—*Simple Fractions of Distillation.*

1, Ammoniacal liquor; 2, light oil, including first runnings; 3, middle oil; 4, heavy oil; 5, anthracene; 6, pitch.

The products for sale will be:

TABLE VI.

1, ammoniacal liquor; 2, light oil; 3, creosote, from 3, 4 and 5, in Table 5; 4, naphthaline, from 3 and 4 in Table 5; 5, pitch.

1. The ammoniacal liquor is disposed of in the usual way. It might be here noted that sulphate of ammonia is manufactured at many gas and coke oven plants in Europe, at some of which the sulphuric acid is made from spent oxide.

TABLE VII.

2. Light oil.

Uses.—Illuminating; enriching gas; mixing with pitch to make varnishes; mixing with anthracine oil to prevent the absorption of illuminants when washing gas to remove naphthaline—usually, however, light oil is rectified to make benzol and naphtha; production of aniline.

TABLE VIII.

3. Creosote.

Uses.—Gas making; varnish making; to soften hard pitch; antiseptic; preserving timber.

When carbolic acid is extracted from middle oil, the residue is added to the creosote. Pyridine bases, which are used for denaturing alcohol, may be obtained from middle oil. Anthracine oil is used for extracting benzol from gas. Pure anthracine is obtained from the anthracine fraction.

TABLE IX.

4. Naphthaline.

Uses.—Color making; making "moth balls;" burning for fuel and light.

TABLE X.

5. Pitch.

Uses.—Manufacture of briquettes (patent fuel); making varnish; roofing; roofing felt; making asphalt; road making and repairing; making lampblack; making coke, gas, etc.

An ordinary retort house tar will yield on distillation per ton (2,240 pounds) about 220 gallons.

TABLE XII.

Ammoniacal liquor	5 gallons
Light oil	6 "
Creosote	61 "
Pure naphthaline	90 pounds
Pitch	1,350 "

The proportion of these products may vary considerably, depending on the temperature at which the coal is carbonized, the character of the coal, etc. Coke oven tar may give about the same amounts of products as the above, but usually the percentage of pitch is less. Coke oven tar contains but a small amount of carbolic acid. In appearance, tar from vertical retorts is similar to that from coke ovens. At a gas plant which I recently established in Japan, tar stills were built because of the small market for crude tar. The plant consists of two 10-ton stills, oil settling tanks, etc., of the same capacity, and

1. "Report of Department of Commerce and Labor."
2. "Report of Department of Commerce and Labor."
3. "Prolonging the Life of Telephone Poles" Year Book, Dept Agriculture, 1905.

a naphthaline refinery about four times the capacity of the tar stills. The latter was built larger on account of crude naphthaline being obtained from other sources. With the distilling of only 5 or 6 tons of tar per day the profit amounts to from $12.30 to $15.70 per ton of tar used, which is equivalent to 5½ cents to 7 cents per gallon. The conditions in Japan are, of course, very different from those in the United States. However, at the present market prices of tar products, it would appear that a good income can be made from distilling tar at gas works in this country, the profit depending mainly on local conditions, the amount of tar available and the products manufactured.

This paper has been put together very hurriedly, as I had no idea, until last week, of presenting it at this meeting. Had I had more time at my disposal other matter would have been included. However, I trust that these few fundamental remarks on the distillation of tar may have the effect of bringing forth some discussion here, and possibly papers at future Association meetings on a subject which, to my mind, is not receiving the attention that it deserves from our gas engineers.

Illuminating Engineering.

[Prepared for the JOURNAL by MR. H. THURSTON OWENS.]

University students are receiving instruction in the engineering of illumination in proportion to the general interest which is now being taken in the subject.

At Columbia University the course in electrical engineering, through the efforts of Prof. Seaver, now includes illuminometry as well as photometry.

As an evidence of the general interest in the subject a meeting, held the evening of March 6th, under the auspices of the Electrical Engineering Society of Columbia University, was devoted to illuminating engineering.

The Society was fortunate in having so eminent an authority as Dr. C. H. Sharp address it. As Dr. Sharp is a past-President of the Illuminating Engineering Society, and as his work in connection with the electrical testing laboratories of New York city is so well known, it is in no sense needful to make further reference to or comment on his ability to speak by the book.

In his opening remarks Dr. Sharp spoke briefly about the great advances, in the past few years, respecting the efficiency of our light sources, both gas and electric, calling particular attention to the fact that the inverted mantle gas lamp had again saved the day for the gas man.

Slides were thrown giving diagrams depicting graphically the relative values of the ordinary carbon, metallized filament, tantalum and tungsten lamps. The subject of illumination was then taken up, showing the methods of calculating and measuring it, and the foot candle and its various applications to horizontal and normal illumination were clearly expounded.

To illustrate the various types of globes and reflectors, slides were shown, giving in great detail the tests made in the auditorium of the New York Edison Company on West 28th street, where a number of different types of illuminants were installed for that purpose.

The results were particularly valuable in showing what a large increase in efficiency was possible by the proper selection and location of the units. The range in efficiency in this case being from 21 to 88 per cent., or, in other words, one system was over 4 times as efficient as another. The subject of intrinsic brilliancy and the effect of light upon the eye concluded the address.

In the discussion, Prof. Parker, of helium lamp fame, called attention to the colors of the different lamps, stating that, owing to its white light, the tungsten lamp had an additional advantage over the old carbon lamp which amounted to 30 per cent.; that is, it was 4 instead of 3 times as efficient.

He also called attention to the fact that the actinic rays were much more harmful to the eye than the intrinsic brilliancy of a light source, citing as an example eye trouble which he had experienced, owing to the happening that in his experiments light rays rich in the ultra-violet had reached his eyes, the light being filtered through quartz. Quartz does not absorb these rays, and he found that, by substituting glass, the trouble ceased. He further stated that he had experienced no ill effect from intrinsic brilliancy, as he was accustomed to look at helium at a temperature which reached 2,100°. C.

Prof. Seaver made a number of telling observations, among which was the fact that city contracts for electric lights called for so many watts, whereas what the public wanted was so much illumination. He thought that one of the developments of the art would make it possible for cities to contract for illumination and not current.

The writer wishes to call particular attention to the fact that this meeting was held by an electrical society. In view of the fact that gas companies have to contend with obstacles within their own ranks, as well as the competition of their aggressive competitors, it is to be hoped that they will take advantage of the knowledge that a large amount of practical data is now available from the proceedings of the Illuminating Engineering Society.

One of the principal obstacles within their own ranks is found in many combination companies, where the decided tendency is to sell gas for power and electricity for light.

The Construction and Costs of a Concrete Gasholder Tank.

[A paper prepared by MR. E. FRITH, of Runcorn, England, for the last meeting of the Manchester District Institution of Gas Engineers.]

At the request of the Hon. Secretary, the writer has pleasure in presenting for your consideration details of the construction and costs of a concrete gasholder tank at the works of the Runcorn Gas Company.

The tank is entirely of concrete, 106 feet diameter by 30 feet deep, from the rest stones to the top of the wall. The wall is 2 feet 3 inches in thickness throughout, with 12 piers of 5 feet by 4 feet. The tank is in the solid ground to an average depth of 20 feet, and is supported with an embankment above ground level. The inside of the tank is faced with cement rendering ¾-inch thick. A 2-lift Gadd and Mason holder of 497,000 cubic feet capacity has been erected in the tank, which has been filled with water for some weeks, and is water-tight.

The construction was spread over a period of 3 years, and was done during the slack seasons by the regular men on the works. The work ceased for the winter when the men were required for their ordinary duties. The site was an old clay pit adjoining an existing gasholder. The surface of the ground was very uneven, and had a rise of 1 in 17 from north to south. The ground was known to be of a very firm character, having about 6 feet of clay on the surface over marl of varying depth up to 10 feet, with shale below to the level of the foundation. Sand was found in large quantities, but only gave trouble on the northeast side, where extra depth had to be provided for the inlet and outlet pipe recess, and on the south side, where large pockets of red moulding sand were found.

The method adopted in excavation was to make an annular cutting of the required radius, 2 feet 3 inches wide, of an average depth of 20 feet, with the necessary provision for the 12 piers. This cutting, when completed, formed the mold for the concrete; the ground on the inside being removed at a later stage, as will be described. The cutting was made in three sections, each being filled with concrete to the ground level before proceeding to excavate the next. It was only where sand was found that much strutting was required; but in bad weather precautions were taken to prevent the clay at the top becoming loosened and falling in. The whole of the ground on the foundation level was very firm, and it was only necessary to undercut the sides slightly to form footings. In making this annular cutting, it was, of course, of the utmost importance to keep the inner side very true; and where a fall of sand occurred, the hollow thus formed had to be filled up to the correct radius with timbering, loose bricks, or clay, according to the extent of the fall. If, however, the fall of sand was on the outside, this was merely filled with concrete as it was reached.

The concrete employed throughout the work was composed of 3 parts brickbats, 3 parts clinker, 2 parts sand and 1 part of cement. The sand used was coarse Mersey sand; no suitable sand being obtainable locally, although Runcorn is noted for its red sandstone. Emphasis must be laid on the necessity for having a large stock of good, clean, hard clinker before commencing any large concrete construction, as clinker has special binding properties. Materials for the work had been kept in readiness, and every available opportunity taken for securing suitable aggregate at low cost. The best quality of English Portland cement was used; and its condition was frequently tested to insure uniformity in the work. A mixing box of the usual type, with sloping sides, was employed; the dimensions being 6 feet 4 inches square by 16 inches high.

A portion of the dumpling, about 30 feet by 12 feet, was laid with concrete to a thickness of 6 inches, to form a mixing stage. This afterwards became the top of the dumpling. This mixing stage served for the whole of the wall to a height of 20 feet, and also for the dumpling; but suitable movable wooden stages were provided for use while constructing the upper portion of the wall (see Fig. 4). The concrete materials were turned over twice dry and three times wet; the

mixing being done by hand. Before placing the first layer of concrete in the cutting, a thick grouting of cement and sand, composed of 2 parts of sand to 1 of cement, was poured over the bottom. The concrete, lowered in buckets, was placed in position while the grouting was still soft; thus insuring close contact and a firm foundation. The layers were about 1 foot in thickness, laid evenly, and sufficiently rammed; care being taken that the concrete and the earth backing were well united. If any spaces could be perceived when the concrete was dry, they were filled with grouting. This practice was continued throughout the whole of the construction below the ground level.

By this means the wall was made quite solid with the earth backing, and the greatest possible support insured for the tank wall. Hollow places on the inner face of the cutting were filled with suitable loose material, such as slate, clay, etc., which could be easily removed when the excavation for the tank took place. After any interval, the surface of the concrete was well watered, and grouting was poured over the work before another layer was put on. At the same time any soil that might have fallen from the sides of the cutting was carefully removed. When the ground level was reached, wooden molds were employed to construct the wall to the required height (see Figs. 3 and 4.) Each section of the mold was made of 2 pieces of 4 inch by 3-inch spruce, 12 feet in length, sawn to the radius of the tank. Twenty-four ¾-inch, tongued-and-grooved flooring boards, each 3 feet long, were nailed across these, on the convex or concave side, according as they were required for the inside or outside of the tank wall.

The sections were kept in place by means of 1-inch bolts screwed at both ends and provided with large washers and nuts. These bolts, resting on the top of the concrete, passed through the boards and across the wall, thus supporting the molds, and when screwed up tightly held them very rigidly. Distance pieces were fixed across the top of the molds at intervals of 4 feet. When fixed, the molds extended about two-thirds of the circumference, and were carefully leveled and plumbed. The concrete was then filled in as before, the long bolts across the wall being built in and withdrawn when the concrete was sufficiently set to allow the removal of the molds. The molds for the piers were in 3 pieces, bolted together at the corners and also to the circular molds. These were of similar construction to the circular ones. The molds were moved round the wall as required, and were lifted as each layer was completed until the right height was reached. (See Figs. 3 and 4.)

When the ground level was reached it was thought advisable to strengthen the wall with bands of iron. To supply these advantage was taken of a disused gasholder, the main bars of which required very little alteration to make them suitable for the purpose. Half-main bars and purlins were also used. At a height of 17 feet—*i.e.*, just above ground level on the northeast side of the tank where the ground was lowest—a strong contractor's rail, about 30 pounds per foot, was placed in the wall round the recess for the inlet and outlet pipe. The first complete band was of 3-inch by ½-inch flat iron, and was placed at a height of 20 feet 4 inches from the bottom of the wall. The second and third bands were of 4-inch by 4-inch by ⅜-inch T-iron, the former being placed 6 inches above the base plates of the holding-down bolts, and the latter 2 feet 6 inches higher.

The fourth band was of 3-inch by ⅜-inch flat iron, 2 feet 6 inches from the top of the wall. Pieces of iron of varying lengths and thicknesses were placed diagonally in the wall about 6 feet apart throughout the whole of the circumference. These served to form a bond with the bands, and so gave the wall greater tensile strength. All ironwork was carefully coated with cement when in position.

When the wall was completed to the ground level, rails were laid entirely round the tank, and a steam traveling crane was used to lift and carry the soil and tip it where required (see Fig. 3). The excavation of the interior of the tank was then proceeded with at intervals; sufficient earth being taken out to supply the requisite backing, for the wall as the height increased. The level of the rails was altered as the wall was raised, and as the crane was travelling on the made ground of the embankment, it made this very solid without any manual labor being required, excepting to keep the rails at the proper level. Sections of the mould used for the wall were employed in making the slopes of the dumpling and in laying in the bottom. Boards which had been used for the inside of the wall were placed at a suitable angle at the base of the dumpling. These moulded the concrete to form a skewback for the slope of the dumpling, which was afterwards built up by means of the boards that had been used on the outside of the wall.

When the excavation of a portion of the interior was completed, the rendering of the inside of the wall was commenced. Any soil adhering to the surface of the concrete was brushed off, and inequalities were removed. The surface, having been made quite clean, was well watered and the first coat of cement roughly applied. When this was sufficiently set the final coat was carefully trowelled on and smoothed down. (Fig. 2 shows the two stages of the plastering of the wall.) The open nature of the concrete made it an excellent key for the cement rendering, the total thickness of which was ¾-inch. When the rendering was being applied to any portion of the tank, laths were laid against the concrete to divide the rendering into sections. These laths were removed when the trowelling ceased. The laths materially facilitated the work of the plastering by serving to keep the thickness of the cement uniform. The spaces left on their removal allowed room for any expansion in the cement when setting, and were afterwards filled up. The holes left in the wall after taking out the bolts which were used to support the molds were first partly filled with cement and then plugged with cores made of pure cement. To avoid the risk of leakage, care was taken when plastering to round off the angles at the base of the wall, etc.

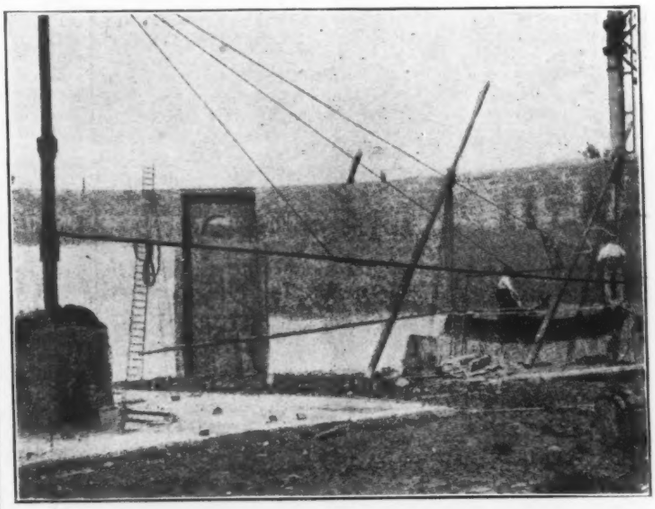


Fig. 1.

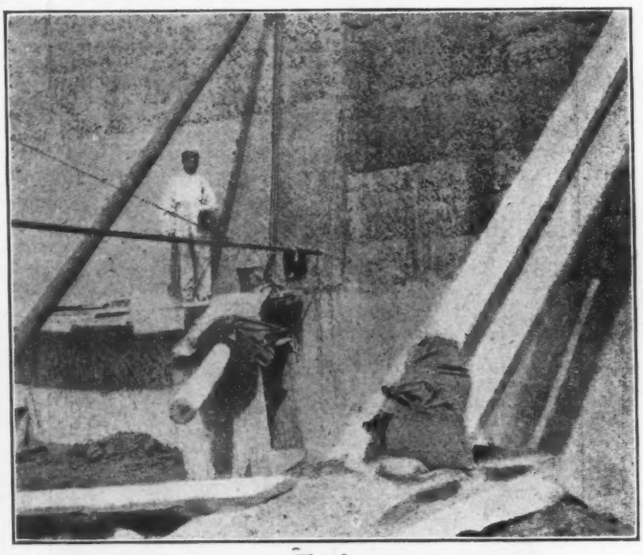


Fig. 2.

The top of the dumpling was left unplastered until the ironwork was completed, so that no damage should be done to the cement rendering by tools, etc., falling during the erection of the holder. The rest stones were made of fine concrete (strength 6 to 1); and in each rest stone, near the foot of the wall, half an earthenware pipe, 6 inches in diameter, was inserted. As the bottom of the tank had been formed with a slope to the wall and with a fall to the inlet and outlet pipe, the drainage of the tank while the ironwork was proceeding was an easy matter. The holding down bolts were built into the wall firmly, and not left loose as is usually done. Great care, therefore, had to be taken to have them perfectly vertical and equidistant. To insure the bolts being in the correct position, cast iron base plates, 2 inches

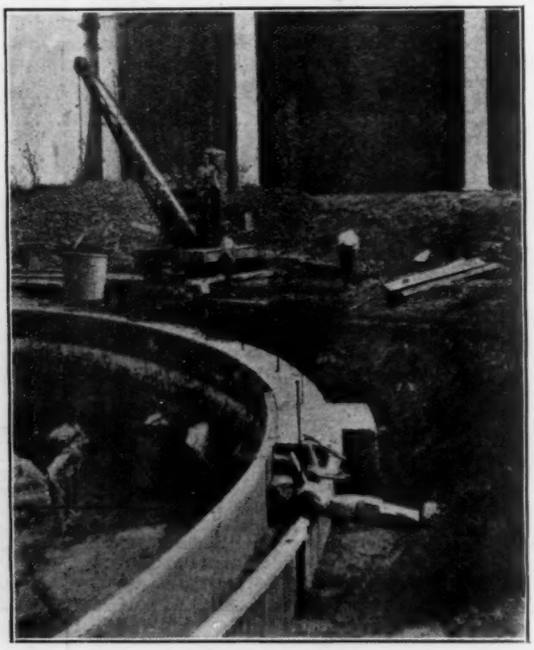


Fig. 3.

Fig. 4.

thick, cast in open sand, were used at the bottom of the bolts. Wooden templates were also employed at the top (see Fig. 4).

The ground in which the tank was built was very suitable for the construction of an ordinary brick and puddle tank, yet the writer's father (the designer) preferred to construct it in concrete with cement facing, because of the solidarity, tightness, and cheapness of this form of tank. Very ample foundations must be provided to insure absolute stability with puddle; but in the case of this tank (as has been shown) no foundations and scarcely any footings were necessary. The impervious character of cement rendering, properly applied, is so well known that it is unnecessary for the writer to say anything about it. The same cannot be said for brick and puddle.

There are many reasons why a concrete tank should be cheaper than one made in other materials. First, absence of skilled labor. Only 4 skilled workmen, 3 bricklayers, and 1 crane driver were employed at one time on this tank, and these only for a few weeks. Secondly, cheapness of materials; concrete aggregate being decidedly cheaper than bricks, especially when the materials have been stored for some time in readiness. Thirdly, absence of all scaffolding. Fourthly, no unnecessary excavation—*e. g.*, in the tank just described no ground had to be got out for work to be done and then replaced.

The cheapness of this tank will be apparent from the following figures:

Tank, including materials and labor	$8,375
Two-lift Gadd and Mason holder, capacity 497,000 cubic feet	19,200
Inlet and outlet pipe, valve, etc.	505
Total	$28,080
Cost of the tank per 1,000 cubic feet of gasholder capacity	$16.53
Cost of the holder per 1,000 cubic feet of gasholder capacity	39.58
Total cost of tank and holder per 1,000 cubic feet of gasholder capacity	$57.00
Cost of tank per 1,000 cubic feet of tank capacity	$30.75

Condition of the Coal Briquetting Industry in the United States.

[A paper prepared for the Department of the Interior, by Mr. Edward W. Parker.]

General Status of Briquetting.—Although the briquetting of coals and lignites has been carried on for many years in Europe, and has reached a particularly high state of development in France, Belgium and Germany, it has made comparatively little progress in the United States. The causes for the backwardness of the United States in this regard are several, and first among them has been the abundant supply of cheap raw fuel with which the manufactured article has to compete. With our millions of acres of coal producing lands, in which the coal can in most places be cheaply mined, it has appeared in many districts to be more economical to waste the slack or culm, which constitutes a considerable percentage of the product, than to attempt to save it at the additional expense required for briquetting. For this reason large tracts in the anthracite region of Pennsylvania are covered by unsightly culm banks which encumber the ground and mar the view, and in some of the bituminous districts huge piles of unmarketable slack are allowed to burn in order to get rid of them. When the coal is of coking quality, or when the slack can be used for steaming purposes, these losses are not sustained, but many thousands of tons of material that might be converted into usable fuel have been wasted every year simply because of the increased expense involved in its preparation.

The development of the briquetting industry has also been retarded by attempts to exploit patented or secret processes, for which all kinds of extravagant claims have been made, but which have almost invariably proved expensive and unprofitable, and the investment of capital in enterprises of this character has been accordingly discouraged. The Patent Office records teem with patents issued on all sorts of inventions relating to binders, many of which are as fanciful as the idea of perpetual motion.

Another reason for the failure to build up a briquetting industry in the anthracite region of Pennsylvania, where the best opportunity for its development is offered, has been the opposition shown by some of the operators to the introduction of a manufactured domestic fuel which would come in competition with the prepared sizes of anthracite. And such an opposition is natural. The competition of bituminous coal has almost entirely shut out anthracite as a steam fuel. Coke for iron making has almost entirely supplanted anthracite, and the use for domestic purposes of coke and gas made from bituminous coal is growing. Owing to the greater depths to which the mining of anthracite is being carried, the thinner and less favorably located beds which are being worked, and the increasing cost of labor, the mining and preparing of anthracite are becoming more expensive on one hand, while competition is becoming keener on the other. A certain rate of production must be kept up for the protection of the properties themselves, and, when all the conditions are considered, the unfavorable attitude on the part of the operators toward further competition is at least realizable.

Still another reason which has been assigned, rightly or wrongly, for our halting progress in fuel briquetting, has been the lack of assurance of a regular supply of coal tar pitch at reasonably low prices. For out of the many attempts that have marked the incubating period of briquetting development—some of them costly—has grown the knowledge that coal tar pitch must be relied on to supply, in the Eastern States at least, all or the greater part of the binding material. In California, Arizona and other parts of the Far West asphaltic pitch, the residual product from the refining of the heavy

asphalt base petroleums of that region, has been and is now successfully used in recently constructed briquetting plants. But in the East coal tar pitch is the base of the economically successful cementing material—a fact that has been fully demonstrated by the extended investigations carried on at the United States Geological Survey's fuel testing plant at St. Louis.[1] These investigations included experiments with all kinds of organic and inorganic binders, embracing, besides coal tar pitch, such materials as rosin, sugar house refuse, molasses, acid sludge, quicklime and various mixtures. The results show that either coal tar or asphaltic pitch is the only really successful binder. Any materials used with them must possess above all others the essential virtue of cheapness.

But while it is claimed on one side that the briquetting industry has been held back by the lack of assurance of a steady supply of coal tar pitch, it also happens that one of the reasons assigned for the comparatively slow development of the by-product coking ovens in the United States in the last few years is the lack of a profitable demand for coal tar, an important by-product of retort coke ovens. It is well known that the demand for creosoting oils to be used by railroad companies for preserving ties, bridge timbers, etc., is far beyond the present domestic production of that coal tar product, and the statistics compiled by the Bureau of Statistics of the Department of Commerce and Labor show that our imports of the chemical products of coal tar amount to over $10,000,000 in value yearly. To the ordinary observer it would appear that the conditions here presented afford an opportunity for the recognition of a community of interests which may be profitable to the manufacturers and beneficial to the general public. The constantly increasing expense involved in mining and preparing anthracite coal is slowly but surely making that commodity more and more a luxury, and manufactured fuel which will take the place of anthracite for domestic use, particularly among consumers of moderate means, appears to be needed. This is especially true in the northeastern section of the United States.

Two of the briquetting plants, which have been recently constructed, and which are discussed in detail in the following pages, indicate somewhat a "getting together" of the coal tar producing and the briquetting interests. These are the plants of the United Gas Improvement Company, at Point Breeze, Philadelphia, and of the Semet-Solvay Company, at Del Ray, Mich. Both Companies are producers of coal tar, and the plants have been constructed for the purpose of briquetting mixtures of anthracite culm and coke breeze.

It appears now, moreover, that the period of failure and discouragement in the manufacture and use of briquetted fuel has passed and that the industry will be placed on a substantial footing.

Briquetting Plants in the United States.—General Statement.

The first successful plant in the United States of which the writer has any definite knowledge was built at Stockton, Cal., a few years ago by the San Francisco and San Joaquin Coal Company. This plant, unfortunately, was entirely destroyed by fire in 1905, and the plans for its reconstruction at San Francisco were interrupted by the earthquake and fire which destroyed a large portion of that city in April, 1906.

During the last two years a number of briquetting plants have been built, and as complete descriptions of them as it has been possible to obtain are given in the subsequent pages. Some of them have been put in operation since January 1, 1907.

The following list, compiled from newspapers and other sources, shows the name and location of companies which have been organized for the purpose of carrying on the briquetting business, or which have constructed plants to operate in connection with an already established industry.

Arizona Copper Company, Clifton, Ariz. In operation. (See pp. 477–479.)

Ajax Fuel Company, San Francisco, Cal. Operated small plant in 1905; destroyed by earthquake and fire in April, 1906.

Pittsburgh Coal Mining Company, San Francisco, Cal. (See pp. 475–477.)

Eureka Briquette Company, Oakland, Cal. Organized, according to press bulletins, with capital of $75,000. Letters addressed to the company were returned unclaimed.

San Francisco and San Joaquin Coal Company, San Francisco, Cal. (See pp. 472–473.)

United States Briquetting Company, San Francisco, Cal. Organized for briquetting mixture of peat and California crude oil. Original plant destroyed by earthquake. Erecting new plant at Stege, Cal. See p. 477.)

Western Fuel Company, Oakland, Cal. Constructed plant in 1905. (See pp. 473–475.)

American Coal Briquette Company, Washington, D. C. Impossible to locate.

Orlando Water and Light Company, Orlando, Fla. (See p. 481.)

Illinois Coalette Fuel and Mining Company, Alton, Ills. Reported as having organized with capitalization of $1,000,000. No replies received from inquiries.

National Compressed Fuel Company, Chicago, Ills. Organized in 1904 for exploiting the Hoffman patent binder exhibited at the St. Louis exposition. Letters addressed to the company have been returned unclaimed.

Anderson Artificial Coal Company, Anderson, Ind. Incorporated, according to press reports, in 1905; capital stock, $50,000. No replies received to letters.

Globe Coal Manufacturing Company, South Bend, Ind. Incorporated in 1905, but a plant has never been erected.

United States Heyde-Brand Coal Company, Berwick, Me. Letters returned unclaimed.

Eastern Coaleo Manufacturing Company, Baltimore, Md. Organized by L. G. McPherson, T. K. Stewart and others, but no progress made.

Boston Coal Briquetting Company, Boston, Mass. Letters returned unclaimed.

Semet-Solvay Company, Del Ray, Mich. (See p. 479.)

General Alexander Hughes, Minneapolis, Minn. Carried on some experiments looking toward the briquetting of North Dakota lignite, but has not established any plant.

International Coal Briquette Company, Minneapolis, Minn. Letters returned unclaimed.

Mankato Peat Fuel Company, Mankato, Minn. No replies to letters.

Valentine Coal Binder and Briquette Company, St. Paul, Minn. Letters returned unclaimed.

Coaleo Fuel Manufacturing Company, St. Louis, Mo. No replies to inquiries.

Renfrow Briquette Machine Company, St. Louis, Mo. (See pp. 481–484.)

United States Artificial Coal Company, St. Louis, Mo. Letters returned unclaimed.

Compressed Coal Company, Camden, N. J. Unable to find.

The Briquetting Company, Jersey City, N. J. Letters returned unclaimed,

McGinnis Coal Briquette Company, Jersey City, N. J. Letters returned unclaimed.

Monon Development Company, Jersey City, N. J. Letters returned unclaimed.

New Jersey Briquetting Company, Jersey City, N. J. (See p. 465.)

Sanitation Coal Company, Jersey City, N. J. Letters returned unclaimed.

Peat Fuel Company of New Jersey, Lincoln Park, N. J. No replies to inquiries.

American Fuel Corporation, Newark, N. J. No replies to inquiries.

American Peat Fuel Company, Passaic, N. J. No replies to inquires.

E. B. Arnold, New York city. (See pp. 468–470.)

The Briquetting Company, New York city. Address given as 52 Broadway. Not found.

Economy Smokeless Coal Company, New York city. Letters returned unclaimed.

D. Grieme Coal Company, New York city. No replies to letters.

International Briquetting Company, New York city. Organized in 1905, but nothing accomplished.

Manhattan Coal Briquette Company, New York city. Letters returned unclaimed.

National Fuel Briquette Company, New York city and Brooklyn, N. Y. (See pp. 477–478.)

New Jersey Briquetting Company, Brooklyn, N. Y. (See pp. 464–467.)

New York Compressed Fuel Company, New York city. Letters returned unclaimed.

North American Coal Briquette Company, New York city. (See p. 478.)

Peat Koal Company, New York city. No replies to inquiries.

Peerless Fuel Company, New York city. Letters returned unclaimed.

Scranton Anthracite Briquette Company, New York city. (See pp. 470–471.)

Standard Briquette Company, New York city. No replies to inquiries.

United States Briquette Company, New York city. Letters returned unclaimed.

Zwoyer Fuel Company, New York city. (See p. 465.)

Briquette Coal Company, Stapleton, N. Y. (See p. 477.)

Koala Fuel Manufacturing Company, Washburn, N. D. Letters returned unclaimed.

1. Bulls. U. S. Geol. Survey Nos. 261 and 290; Prof. Poper U. S. Geol. Survey No. 48.

Hon. W. D. Washburn, Wilton, N. D. (See p. 480.)

Composition Fuel Company, Johnstown, Pa. No replies to inquiries.

United Gas Improvement Company, Philadelphia, Pa. (See pp. 471–472.)

R. B. Metcalf, Providence, R. I. Operated a briquetting plant at Portsmouth about 10 years ago. Coal found to be unsuitable for briquetting.

International Compress Coal Company, Houston, Tex. (See p. 480.)

North Fort Worth Patent Fuel Company, Fort Worth, Tex. No replies to inquiries.

Eureka Briquette Company, Rockdale, Tex. (See p. 480.)

American Lignite Briquette Company, San Antonio, Tex. (See p. 480.)

International Fuel Company, Rutland, Vt. Organized by the late Henry R. Dorr to manufacture briquettes from anthracite culm. Nothing done since the death of Mr. Dorr in 1906.

Bellingham Briquetting Company, Bellingham, Wash. Organized with a capital of $75,000; nothing done in the way of construction.

Southern Pacific Coal Company, Carbonado, Wash. No replies to inquiries.

Pacific Coke and Coal Briquetting Company, Spokane, Wash. Letters returned unclaimed.

NEW YORK, N. Y.

New Jersey Briquetting Company.—During 1904 and 1905 the New Jersey Briquetting Company, of New York, constructed at the foot of Washington street, Brooklyn, a plant for exploiting the Zwoyer Fuel Company's briquetting process. This plant was intended to be operated in connection with a coal yard on Adams street, but during the construction of the piers and anchorages for the new Manhattan Bridge the Company was prohibited from operating the tramway from the coal yard to the plant. This interferred with the operations of the plant, and as extensive storage capacity, either for raw material or for the product, had not been provided for at the site, the work done has been accomplished under much disadvantage. The prohibition put on the tramway and the lack of dock facilities for loading and unloading material have crippled the plant to such an extent that what was supposed to be an excellent location has turned out to be an unfortunate one, and the present methods of receiving and handling the material make the operations so expensive that the briquettes cannot successfully compete with raw fuel. As a result of these unfortunate conditions it is proposed to remove the plant to a site better adapted for receiving, storing and shipping the material. The officials of both the New Jersey Briquetting Company and the Zwoyer Fuel Company are entirely satisfied with the experimental results. A description of the plant in Brooklyn was published in the *Iron Age*, from which the following notes have been in part abstracted, additional matter having been furnished by Virgil H. Hewes, Treasurer of the Zwoyer Fuel Company.

Prior to the construction of the plant in Brooklyn the Zwoyer Fuel Company had built a small plant in Jersey City, N. J., which was of sufficient capacity for experimental work, but not large enough to be operated as a commercial undertaking, and was abandoned.

It may be stated here that, after a considerable expenditure of time and money in experimenting with different kinds of binders, coal tar pitch was finally selected as the material best suited to the work, a decision which has been generally reached in the Eastern States, asphaltic pitch having been adopted in the Far West, where that article is cheaply obtained. During the progress of the experimental work about 200 tons of briquettes were made with a binder composed of 6½ per cent. of rosin and oil, 1½ per cent. of flour and water, and 6 to 10 per cent. of bituminous coal, the body of the briquette being anthracite dust. About 900 tons were made with 5 to 7 per cent. of rosin and oil and 10 per cent. of bituminous coal, 400 tons were made with 5 to 7 per cent. of wood pitch and 10 per cent. of bituminous coal, and 1,500 tons were made with 6 to 7 per cent. of coal tar pitch alone. In applying the binder during the last three experiments an atomizer was used.

The plant in Brooklyn has a capacity of 10 tons an hour and was built for the purpose of demonstration. During the winter and spring of 1905–6 about 3,000 tons of anthracite briquettes were made and sold. The price received was $5 per ton of 2,000 pounds at the plant, $5.50 per ton delivered, and $6.60 per ton in bags of 100 pounds each. These prices were 50 cents below the prices of the domestic sizes of anthracite.

The building is nearly triangular in outline. The anthracite dust is received on Washington street at the end of a screw conveyor, which carries it to the foot of an elevator, where it is lifted to the top of the plant and spouted to a screen located over the dust bin. The coarser material is spouted either to the boiler room or to an oversize bin in the rear of the dust bin and then fed into a crusher, crushed and passed to the foot of the dust elevator, where it is again carried to the screen. The dust is drawn from the dust bin by a conveyor, driven from a variable speed countershaft, and is fed to the 16 by 36-inch roll crusher. It then passes to an elevator and is carried to the mixers. After passing through 6 mixers it is carried to the second floor, where it falls into the press hopper.

From the press the briquettes are carried by a belt conveyor to the baking oven (when smokeless briquettes are wanted) and are then elevated to and distributed upon the cooling table, which is located on the second floor. After cooling, the briquettes are run into chutes and loaded into wagons for delivering, or are stored. In New York the briquettes sell readily when not baked.

On one side of the dust bin there is a bin from which soft coal is fed into a 19 by 4-inch roll crusher and passed to the same elevator that carries the dust to the mixers. Development has shown that it is not necessary to use soft coal with anthracite dust. However, this bin is used when experimental runs are made requiring the mixing of different materials with the dust.

The binder used is coal tar pitch, which is received in barrels on the Plymouth street side of the building. It is hoisted to the second floor by means of a barrel hoist; the staves are then removed and the pitch is thrown into the binder melting tank (a tank holding about 15 tons of pitch) and pumped by means of a rotary pump into the storage or hot binder tank, where it is kept heated. The number of units necessary in a mixer depends on the material to be briquetted and the condition in which it is received. At this plant 6 mixers are used, which have proved well adapted to the handling of coal (hard and soft, wet or dry), coke breeze and even iron concentrates.

The dust enters mixer No. 1, and is carried through mixers Nos. 1 to 6, and then by conveyor to the press. In passing through mixers Nos. 1 and 2 the dust is heated by furnaces to drive off all the moisture. The coal tar pitch, which has been previously heated, is pumped from the storage tank by a small rotary pump driven from a variable-speed countershaft, which regulates the percentage of pitch used. The pitch is atomized by means of a steam jet and delivered to mixer No. 3. The above apparatus and process are patented.

A press of the roll type is used, the rolls being built up of disks which are milled to form the pockets and then assembled and bolted together on the shaft. This method of constructing the rolls, as well as the design of the briquettes, is patented. Briquettes are made in two sizes—1¼ by 1¼ by 1¼ inches and 2½ by 2½ by 1¼ inches. The briquettes are square "pillow" or "pin-cushion" shape. The smaller ones weigh 2 ounces and the larger 3.3 ounces.

The cooling table consists of 3 endless belts composed of steel plates carried at their ends by sprocket chains. The belts are placed one over the other and carry the briquettes back and forth 6 times over a distance of 84 feet, making a total travel of 504 feet. The briquettes are then run into bins or loaded into wagons.

Staten Island Plant.—The Briquette Coal Company, J. P. Egbert, Manager, No. 2 Stone street, New York city, has just completed the construction of a briquetting plant at Stapleton, on Staten Island. This plant is constructed for the purpose of using anthracite dust as delivered at the plant, with coal tar pitch as the basis of the binding material. The plant does not possess any novelties in its design except that there are two presses of radically different type. One of these is of German manufacture, having been built at the works of Schuctermann & Kremer, of Dortmund. The press is of the plunger type and in the manner of feed, compression and ejection is similar to the Johnson (English) machine used at the Geological Survey testing plant at St. Louis, except that the disk containing the compressing molds is set and revolves horizontally instead of vertically. The briquette is a parallelopiped in shape, with the end edges rounded. The dimensions are 4¾ by 2¼ by 2¼ inches and the briquettes weigh about 1.5 pounds. They have a specific gravity of about 1.24.

The second press is of what is generally classed as the Belgian type, similar to the one described as the "American" machine used at the Geological Survey testing plant. This particular machine was made at the works of H. Stevens, at Charleroi, Belgium. The product is of the eggette pattern, which is more desirable for domestic use than the larger briquette. The eggettes weigh about 5 ounces and have a specific gravity of 1.37. The Manager of the Company, Mr. Egbert, extended to the writer every courtesy possible. The total capacity of this plant, with both presses in operation, is 120 tons of briquettes per day of 10 hours. The German machine will turn out 4½ tons and the French machine 7½ tons per hour.

South Brooklyn Plant.—Another plant, which has just been com-

pleted as this report is written, is that of the National Fuel Briquette Machinery Company, of New York city. The plant is located at the foot of Court and Smith streets, Brooklyn, close to the Gowanus Canal, by which the materials to be used can be brought in barges and discharged at a minimum of expense. While intended to be operated on a commercial basis, it may be considered rather as a demonstrating plant. It is planned to use anthracite dust, with coal tar pitch as a binder. The press is of the Belgian type, producing eggettes or "boulets," somewhat smaller than an ordinary hen's egg, and made exclusively for domestic use. The machinery used in this plant was patented in this country (U. S. Patent No. 799,149, Sept. 12, 1905), by Robert Devillers, with whom the writer visited the plant and to whom acknowledgments are made for courtesies extended. The eggettes here produced are much smaller than those ordinarily made, weighing only about 1.5 ounces each. They have a specific gravity of 1.3.

North American Coal Briquette Company.—This Company, whose office is at 177 Broadway, New York city, has been incorporated for the purpose of exploiting the Forst briquetting process. The main feature of this process consists in the material to be used as a binder, part of which is kept secret, but which consists principally of coal tar pitch. The merit claimed for the secret ingredients of the binder is that they permit of great economy in the quantity of binder used for the manufacture of superior briquettes. The Company has negotiated for the purchase of a Duprey (French) machine, and has sent 10 tons of anthracite coal and 1 ton of binder to Paris for the purpose of demonstrating the claims made for this process.

The Mashek Briquetting Process.—The briquetting press, designed by G. J. Mashex (now with the Traylor Engineering Company, New York city), was described in detail by him in the *Iron Age* of April 19, 1906. It was designed for the purpose of overcoming the objections to the use of briquetting machinery which had developed principally through the failure of certain foreign made machines to meet the re quirements of the American trade. When Mr. Mashek started on the development of his plans, in 1903, the general tyye of machine in use in Europe was that which made large, rectangular-sided briquettes, weighing from 7 to 20 pounds each, and these proved unsuitable to American use. In designing his press Mr. Mashek adopted the Belgian idea of molds contained in the peripheries of two tangential wheels, but, instead of the eggette pattern, developed one which minimizes the blank spaces between the molds and produces a briquette of pillow or pincushion shape.

The Traylor Engineering Company has recently built for E. B. Arnold a Mashek press, which has been installed at the foot of West 47th street, New York city. The building was designed and erected for, and originally equipped with, a different type of machinery, but the briquettes made proved to be of a shape and character unsuited to the trade, and the cost of manufacture was also too high to enable the briquettes to compete with natural coal. When it was decided to substitute a Mashek press for the old one, it was also deemed advisable to use the same building, which is a substantial one, and also as far as possible the old machinery (such as elevators, shafting, power plant, etc.), which was practically new and in good order, but which did not permit the most desirable arrangement,

The new press installed has a capacity of about 14 tons of 2-ounce briquettes per hour, but on account of the inconvenience resulting from the use of so much of the old equipment it is impossible to handle sufficient material to keep the machinery running at its full capacity and it is now operated at the rate of about 10 tons per hour. The cost of labor, fixed charges and other expense being the same, the cost of production is slightly higher per ton of briquettes than it would be if the plant were operated up to its maximum capacity. The size of the briquettes has been determined by putting them on the market and selling them for domestic purposes, starting with 1-ounce briquettes and running up to 3 ounces. It was found that the majority of users preferred a 2-ounce size, which corresponds with the "stove" size of anthracite. The weight, of course, will vary with the nature of the dust from which the briquettes is made, and it has been found that in using coke breeze a 2½-ounce briquette is most desirable, and about a 3-ounce if made of soft coal and lignite. The press is so designed that a change of the mold shells can be made in about 2 hours.

The anthracite dust is elevated to the dust bin, from which it is drawn by a feed conveyor so arranged that the feed is constant and can be regulated as desired. This conveyor discharges into a chain elevator, which in turn discharges into a battery of five 18-inch rotary driers and heaters. These are superimposed one above another and all bricked in. The material is conveyed through these driers by means of screw mixers until it passes into the elevator.

On the side of these driers is constructed a furnace, the products of combustion from which are distributed into the driers through openings into the different units, so that no unit gets heat sufficient to either char the dust or burn out the ironwork of the paddle conveyor. An exhaust fan draws off the products of combustion and the moisture. The temperature of the discharge gases and moisture from the drier rarely exceeds 212° F. After the material passes out of the drier into the elevator it is raised and dropped into a 36-inch Williams pulverizer, which crushes the larger pieces so that everything passes through about a 12-mesh screen. From the pulverizer the material is again elevated to another series of mixers and coolers similar in construction to the driers. At this point the anthracite dust has a temperature of about 300° F. The coal tar pitch is here introduced by means of a pitch pump so arranged that it will deliver a definite quantity of pitch, as desired. Alongside of the last battery of mixers is a small furnace which heats the two upper mixers, maintaining an even temperature in the mixture and not allowing it to stiffen or set. From the last mixer the material drops to an elevator that takes it up to the second floor and discharges it onto an 18-inch belt conveyor, which delivers the material into the hopper of the press. The press is run continually, discharging the briquettes into a perforated pan conveyor, which conveys them to the briquette bin. While in this conveyor the briquettes are subjected to a heavy spray of water in order to cool and clean them.

The coal tar pitch used in this plant is of the ordinary roofing hardness. It is delivered by lighter on the adjacent dock and carted to the pitch melting house, where it is melted in a tank, 6 feet wide, 12 feet long and 8 feet deep. This tank will hold about 22 tons of pitch, which requires approximately 20 hours to melt. After the pitch is melted and brought up to the proper temperature for use, it is drawn off by means of a large pitch pump into the "prepared-pitch tank," from which it is pumped into the mixers.

This plant requires about 125-horse power to turn out 10 tons per hour. It has been in operation about 2 months and is said to be giving excellent results. The product is used almost entirely for domestic purposes and commands the same price as the best grade of prepared anthracite coal in the New York market. A large portion of the output is put up in paper bags and handled by grocers and small coal dealers the same as charcoal or crushed coke. The bag trade caters to the poor people who do not buy in large quantities and is a considerably cleaner method of distributing the product than that formerly used.

The briquettes are handled in the same way as ordinary coal, and experience in this and other plants has shown that abrasion or breakage averages about 3 per cent., which is slightly less than that with ordinary prepared coal.

(To be Continued.)

The Relation of Illuminating Engineering to Architecture, from the Engineer's Standpoint.

[A paper prepared by MR. E. L. ELLIOTT, for the New York Section, Illuminating Engineering Society.]

According to the most plausible theory of man's descent, the original "family tree" of the whole human race actually stood in the forest, and our common ancestors disported themselves among its branches, instead of merely having their cards attached, as represented by the present day genealogists. At a subsequent time natural caves furnished shelter from the elements, and the too familiar attentions of the larger and fiercer animals. As developing intellect began to give primitive man the ascendancy over the lower orders of brutes, he began to construct shelters out of stones and boughs. These shelters were, of course, the work of the individual dweller. With the development of such rude shelters into more elaborate dwellings, such structures enlisted the co-operation of a number of individuals. Co operation invariably requires leadership. Where the work of more than one individual is directed to a common end there must be a director. Thus, in the development of building, there came a time in its very early stages of development when a master-builder was a necessity. The word "architect" is merely the Greek equivalent of master-builder.

The fundamental purpose of the architect is thus disclosed; namely, to plan and direct the construction of a building so that as a whole it shall fulfil all the purposes for which it is intended. Herbert Spencer has shown that the aesthetic instinct takes precedence of the desire for protection in the evolution of dress; and while the same order can probably not be shown in the evolution of building, it is certainly

true that the desire to decorate was very nearly contemporaneous with the ability to build. Thus, almost from the beginning, building involved two theoretically distinct elements; namely, utility and beauty. These two elements, however, were practically connected; and thus the architect became not only the mere director of labor, but the originator and arbiter of art as applied to building.

In the advance of civilization it came about that structures were frequently erected in which the artistic or aesthetic elements predominated. Such buildings were intimately connected with the religion of the time, or with the government, or with both, which were generally closely allied. The aesthetic effect served an important purpose in impressing the people with the authority of their government and religious institutions. The few remaining portions of early structures of this kind, together with contemporaneous descriptions and other evidences, show that, in point of grandeur and beauty of conception, and even in skill of execution, many of these structures have never been surpassed. They were wonderful embodiments of the highest degree of artistic taste and originality, coupled with the lowest form of human labor. Massive blocks of stone were quarried and hauled comparatively long distances, and fitted into their prescribed places with consummate skill, so far as the actual results were concerned; but this was accomplished with a total disregard of human life. These much admired structures are monuments of the most debased form of human labor conceivable; namely, hopeless and abject slavery. An outline drawing found on an ancient ruin shows a huge block of stone, with scores of men pulling it along on a prepared track by means of ropes, while a single individual sits on the front of the block pouring grease upon the slideway. Neither time nor human life spent in this unspeakable drudgery was considered. The substitution of the forces of nature for the mere brute force of the human muscles is an entirely modern development. The utilization of natural forces to accomplish what had hitherto required the muscular power of human beings, is the foundation of modern engineering. Where the ancients piled one stone upon another, achieving a result which in itself was grand and beautiful, but which required centuries of labor and the waste of innumerable human lives, modern civilization accomplishes equally great results within the space of months or days, and with no greater expenditure of brute force than the workman may exert in carrying his full dinner pail. That is engineering. Strictly speaking, there are no remnants of any ancient structures which show the application of true engineering principles; for engineering implies not only the achievement of results with the minimum of material and labor, but a degree of classified knowledge which enables the engineer to predetermine accurately the exact amount of any given material, and the form necessary for it to take in order to secure these results. Such knowledge belongs only to modern civilization.

What we term "modern civilization" is characterized by its extreme complexity as compared with ancient civilization; and this complexity is largely the result of a vastly greater knowledge of natural phenomena. In a single century we have learned more of the workings of nature than had been found out in the entire previous existence of mankind. The result of this has been twofold? It has transformed the large majority of human beings from mere engines of force into sentient creatures, who are thereby free to develop those mental powers which lift them above the animals. As a direct consequence of this emancipation, the human family is on a vastly higher plane of intelligence and general happiness. Let those who are disposed to exalt the glories of ancient times, as shadowed forth in the few early sublime efforts of human intelligence shown in ancient writings and religious temples, be reminded that what we to-day are so fond of calling the "common people" were in those past times brute laborers held in hopeless and degrading servitude. And let those who are disposed to cavil at the "materialism" of modern science be admonished that it is to the scientist and engineer, "materialist" though he may be, that every individual to-day is free to work out his own destiny.

Even admitting that we have less commanding geniuses in the field of art than may have existed in the palmiest days of Greece and Rome, it is indisputable that the total amount of artistic appreciation among the masses of people is incomparably greater; and it is the scientist, with the engineer, who brought this about.

This preamble may perhaps seem far from the topic proposed for discussion in this paper; but it is always well to begin with fundamentals. Furthermore, there is still a very considerable degree of feeling among modern architects that the engineer and all his works are of the earth earthy, and constitute a sort of necessary defilement of the rarefied spiritual atmosphere in which they should by right dwell. This condition was more forcibly than elegantly expressed by an architect, who said, of a client who insisted upon arguing from the utilitarian standpoint, "He talks like a —— engineer." It is a matter of record that the architect has occasionally so far lost sight of this lower utilitarian plane as to omit such trifling utilities as stairways; and as the unappreciative client climbed to his bedroom on a ladder placed on the outside, we may well imagine his consigning the architect to those same regions to which the architect wished to send the too materialistic engineer.

Ancient and modern civilizations have scarcely a single important element in common, barring the elemental human passions, which never change. There is scarcely a phase of life which is not essentially different to-day from what it was in ancient or mediaeval times; and this radical difference is, and by right ought to be, exemplified in modern building. In Greece a philosopher gathered such people as had the time and disposition to hear him beneath the shade of a tree, and expounded his doctrines. The modern counterpart of this is the University, with its millions of dollars' worth of buildings and equipment, its thousands of students and its hundreds of instructors and professors. In place of the parchment scroll we have the daily newspaper, produced at the rate of several thousand complete copies a minute. These two instances give a fair measure of the all but infinite space between the old and the new. And yet the modern architect seems to have but one anchorage in which he has explicit faith, and that is veneration for antiquity; when he casts loose from this he drifts and tosses about, and knows not whither to direct his course. He dare not discard the parchment scroll, but would have it printed on a rotary press. Appreciating the simple beauty of the monolithic column, he strives to attain it with steel beams, hollow brick and cement. Inspired by the majesty of the gothic arch, he reproduces it in lath and plaster.

The habit of clinging to past forms of architectural expression is not infrequently carried to the point where it becomes ludicrous. The wind-swept island of Great Britain naturally developed a type of cottage having long stretches of sloping roof, designed to keep the whole structure as near to the ground as possible. As this developed in the very early period of the art of glass making, the windows of necessity were divided into a large number of small panes. Incredible as it may seem, one of the first so-called "sky-scrapers" to be erected in New York was modeled after this type of cottage. The building is still standing at No. 1 Broadway, and has the distinction of being the only "Queen Anne" office building in the metropolis. On the other hand, the pointed arch, the succession of long vertical lines, and the versatility of adornment, which are the basis of gothic architecture, and which would lend themselves to modern building with comparatively little violence to the original spirit of conception, have been only recently attempted, and then only in a timid and half-hearted manner. But even this cautious attempt has resulted in the most beautiful facade of any office building in the city, as will be seen by observing the Trinity Building from the south. Eliminate the evidences of ancient and mediaeval architectural features and what have we left to represent modern civilization? In public structures, only what is often well expressed as the "drygoods box" type, of which examples are too numerous to mention; and in private residences, what Lawson has picturesquely characterized as a "pastry cook's nightmare in bronze and marble."

The simple truth is that modern civilization has not yet expressed itself in architecture. Were our nation to be suddenly blotted out to-day, the structures which would most adequately portray its habits of life and planets of thought would be our engineering works—our bridges and tunnels, our railways, mills and factories. In point of beauty some of our modern bridges may be put along with any architectural structure of antiquity. True, the beauty is of quite a different type; but so was beauty of person of a different type in ancient times.

Reduced to its lowest terms, the business of the engineer is to produce a given physical result with the minimum of material and labor; and the justification for his vocation must be found in the extent to which he can accomplish this end. Emerson has defined beauty, taken, of course, in its physical or material sense, as "that which has no superfluous parts, which exactly fulfills its purpose." In following this definition the work of the engineer is beautiful to exactly the degree that it is efficiently done. Broadly speaking, the modern building is simply an aggregation of utilities. With very few exceptions it is simply a part of a vast machine; a machine being properly defined as any device which enables man to accomplish

more or better work than he could do without it. Apply this at random and see how well it fits. The factory building exists because it enables work to be done that could not be done at all in the dwelling, or that can be done to better advantage; and it is as much a fundamental part of the apparatus for producing the particular articles made as is the engine or machinery. So the office building is merely a device by which the various operations of accounting and communication can be efficiently carried on; and so with the store, the school house, and, to a large extent, even the dwelling. Almost the single exception is the church; and this, from being almost the only form of public building, has become a comparatively infrequent and inconspicuous structure.

Building to-day has, therefore, become almost entirely an engineering problem; and with the vast increase in the complexity of life which characterizes modern civilization, has arisen the necessity of subdividing the general problem of construction into a number of distinct branches. Among these are the purely mechanical construction, which has given rise to structural engineering; the methods of heating and ventilating, with its special engineering; electrical equipment, with its electrical engineering; provisions for sanitation, with its sanitary engineering; and lastly, the necessities for artificial illumination, demanding illuminating engineering. All but the last mentioned of these special branches of engineering have gradually been necessitated in the evolution of building, and have been accepted by both architect and client. It is only the last that is still to some extent in the undeveloped state.

Accepting the formula already given as to the general field of engineering, we arrive at the fundamental proposition that the business of the illuminating engineer is to produce a given or required result of illumination at the minimum outlay for the original installation and subsequent maintenance cost. This leaves one highly important question still to be settled; namely, who shall determine what the required illumination shall be? Evidently this question must be decided jointly or separately by the three parties to the contract; namely, the owner or client, the architect, and the illuminating engineer. It may be stated without fear of serious contradiction that the owner has fully met his responsibility in the premises when he has clearly set forth the exact uses for which the various parts of the structure are to be put. It then lies between the architect and the illuminating engineer to determine what the best illumination for each and every particular case may be. As between these two parties, the greater economy of thought and labor will be secured by placing the responsibility upon the illuminating engineer. To determine just what manner of illumination is best for all the numerous and widely varying conditions of modern life requires an extent of technical knowledge, and a breadth of experience which the architect may very appropriately and wisely avoid, providing the results can be obtained from other sources. It is simply a matter of division of labor and economy of human effort. Modern civilization demands that the individual shall be able to do some one thing completely and well, and shall not spend his time in doing things which he can only do indifferently, and which others can do more efficiently.

Benjamin Franklin used to set his own writings in type, put them in the press, and take a hand in running off the printed sheets; and even Horace Greeley was in the habit of going to the cases and setting up his own editorial in his early days; but this was not true economy of human effort. There was many a one who would have been glad of the job of setting the type, whose written productions would have been of infinitesimal value. Surely the architect of to-day has a sufficiently wide and dignified field for his labor in the legitimate work of unifying and harmonizing all the diversified elements that enter into a building, without bothering his head about the infinite details of these different elements.

The advent of the illuminating engineer as a specialist should be hailed with greater delight and relief by the architect than by any other member of the community. Having satisfied himself of the competency of the illuminating engineer, just as he would satisfy himself of the competency of the electrical, or construction engineer, the architect can turn over the plans of the building, with the specifications of the use or uses to which it is to be put, and probably also a statement of the illuminant to be used, and leave the entire technical problem to the illuminating engineer. On the other hand, the illuminating engineer must have authority commensurate with his responsibility. The architect would not think of arbitrarily changing the specifications of a structural engineer without his full consent, and for the same reason the plans of the illuminating engineer should be equally respected.

There is no difference, however, between these two branches of engineering as connected with building; the skeleton of a building, which is the work of the structural engineer, is hidden when the work is completed: but the apparatus especially connected with the illumination is not only in plain view, but so conspicuously in sight as to form one of the necessary elements in the artistic whole. This phase of the problem of illumination, therefore, falls within the legitimate province of the architect. There is clearly but one solution of this apparent clash of authority, and that is co-operation between the architect and the engineer. The engineer demands a certain physical result; the architect demands certain structural features or conditions in order to produce the general harmony of result which it is his business to secure. How shall these two demands be reconciled? Evidently there will be a large number of cases in which no reconciliation will be necessary; all that is required being such a versatility on the part of the engineer that he can design the physical part of the installation so that it will produce both the physical and artistic results demanded. It is conceivable, however, that cases may arise in which the artistic conditions required by the architect can be secured only at a greater or less sacrifice in economy. The decision then very clearly rests with the client. The possibility also still remains of the architect specifying certain conditions which he considers essential from the artistic standpoint, but which the engineer deems not only uneconomical, but positively detrimental in point of the resulting illumination. Who, then, shall decide? In this, as in all other cases, the client is the court of last resort, on the generally accepted theory that he who buys an article has a right to dictate as to its character. If a man chooses to work by light which is dangerous to his eyes, or is ill-suited to the purpose for which the illumination is required, for the sake of the supposed artistic effect, he can hardly be denied his right to such a course, however foolish it may seem to the engineer. Such cases, however, are hardly likely to occur under proper conditions. There are few persons who would willingly subject their eyes to a dangerous strain, or handicap the efforts of themselves or their employees by bad light after having been duly warned.

Since the larger proportion of buildings at the present time is predominantly utilitarian, there is extremely little opportunity for any disagreement between the illuminating engineer and the architect. In all this large majority of buildings the general artistic talent of the illumination engineer should be sufficient to avoid such breaches of taste as would be objectionable. This class of building includes factories of every description, office buildings, school houses, and the larger portions of hotels and public buildings. In the case of a large number of residences the illuminating engineer should also be competent to lay out, or pass upon, every feature of the installation. There remain then only the more pretentious class of dwelling houses, churches, theaters and to a partial extent libraries and public buildings, in which the co-operation of engineer and architect is essential. In these cases the artistic features of the lighting installation are of such importance as properly and justly to demand the attention of the architect. However, while the architect is properly the arbiter in such cases as to the artistic side of the problem, the services of the illuminating engineer are no less valuable than in the other cases. Let it be clearly understood that art as applied to architecture does not exist for its own sake, but is only directed to the embellishment of the necessary and essential physical features of the building. Good decorative art is not only compatible with an efficient physical result, but can be considered of the highest order only when it conforms to good mechanics—in fact, decorative art rests upon a purely scientific basis.

A careful analysis of the respective provinces of the illuminating engineer and the architect, therefore, discloses no more ground for mutual disagreement and distrust than between the architect and any other engineering specialist. The passive or active antipathy which has thus far existed to a greater or less extent on the part of the architect toward illuminating engineering appears to be wholly unjustifiable; and it may be worth while to seek the reasons for this apparently groundless opposition. The most obvious cause of this feeling may undoubtedly be found in the fact that the illuminating engineer has thus far been to a large extent a reformer; in fact, the very existence of his profession may be directly traced to the prevalance of bad practice in the use of light. The faults of illuminating installations as designed under past conditions at last became so numerous and so obvious that there arose a demand for reform. It was hardly to be expected that those who had perpetrated the outrages would themselves turn about and reform their own works. The reform had to be through the agency of independent individuals who made a particular study of the special conditions needing the reform. It is also to be expected that those responsible for malpractice will defend themselves and their works with all energy, until they are convinced of the futility of such a course. The work of the

illuminating engineer thus far has, therefore, been necessarily directed to a large extent toward pointing out the faults of the prevailing practice. Such a course is by no means the most agreeable of tasks, but is a necessary preliminary to better work in the future; and the illuminating engineer must not shrink from this task until the absolute soundness of his contention has been universally recognized.

In most cases the sins of the architect have been rather of omission than commission. With the increasing demands upon his attention from the growing complexity of building, he has given less and less attention to details, and seemingly the least attention of all to the extremely important matter of artificial illumination. Lighting systems have been put in either without the slightest regard to the scientific principles involved, or at best with the aid of a few rule-of-thumb formulas which were as apt to produce faults as anything else. Only the greater ignorance of the client has prevented an earlier upheaval. Were proportionately serious mistakes made in other points of construction, there is scarcely one building out of ten that would be accepted by the owner when completed. What would one say, for example, on learning that the heating apparatus in his building was wasting 25 per cent. or even 50 per cent. of the fuel? And yet such losses in light are by no means uncommon.

Perhaps from a natural inclination to avoid details, the architect has very frequently delegated his duties to the fixture manufacturer, with the result always to be expected when the blind leads the blind—namely, that both have fallen. The sins of omission committed by the architect were even surpassed by the sins of commission committed by the fixture maker. Where the architect specified a number of light sources, figuring in a vague way on the illumination which they would produce if unobstructed, the fixture manufacturer has perhaps reduced the illumination to one-half by the accessories and construction used. It is quite to be expected, therefore, that the fixture manufacturer should not welcome the illuminating engineer with open arms. It is bad enough to have one's faults baldly pointed out; but when such faults have been an important source of revenue, the sting is so much the keener. There is no denying the fact that a very considerable part of the faults of lighting fixtures is directly traceable to a desire for profit.

Recently a lighting installation in a public building caused a political scandal, owing primarily to the discovery of the fact that the fixtures had been sold to the State by the pound; or more properly speaking, by the ton. But it was rather the fact that the interested parties had overreached themselves than in the method of computing values that constituted the novelty of the crime. As a matter of actual fact there are any number of cases in which the real or apparent weight is the actual basis of value. Look at any fixture you please and judge for yourself how much of the metal work is essential and how much is a mere excrescence hanging on in the name of art, but having its true motive in the pocketbook. It is the existence of this condition of affairs that made it necessary for the illuminating engineer to give greater consideration to the artistic side of their subject than ideal conditions would require or justify, and as long as the condition prevails their efforts must continue.

The architect has had the reins from the beginning of history to the present time, and must be held wholly responsible for the results. If these are faulty, there need be no hedging on nice distinctions as to exactly whose duty it may be to institute the reform. The reformer is justified by his works.

The principal point in dispute thus far between the illuminating engineer and the architect seems a question of jurisdiction. The architect has been comparatively ready to admit the authority of the illuminating engineer in regard to the purely physical and economical aspects of the question, but has denied his authority in matters pertaining to the aesthetic or decorative features involved. The engineer, on the other hand, has contended that under this ruling the architect can practically overthrow the results of his labor by setting up the claim of aesthetic requirements. On the general principle that "he who seeks equity must come with clean hands," the illuminating engineer is disposed to hold up the examples of architectural aberrations, which are so conspicuously numerous, as an answer to the implied charge that he is incompetent to form a correct judgment in matters of art. So long as such architectural monstrosities as the New York Custom House, for example, continue to obtrude themselves on a helpless public, illuminating engineers will not be disposed to yield too readily to assumptions of artistic superiority on the part of architects.

Since illuminating engineering involves questions of decorative art there is no reason why the illuminating engineer should not make a sufficient study of this side of his profession to become an adept. The principles of art as applied to architecture are within the grasp of any intelligent person having a reasonable amount of native appreciation, and there is no more reason why the illuminating engineer should not master these principles, at least in so far as they affect his profession, than there is for the architect not acquiring the general principles of structural engineering.

Whatever his incompetency may be in regard to the purely artistic side of the question, one invaluable result is sure to follow the agitation that has been set up is a greater amount of attention on the part of both professional and layman to the subject of illumination. The results in this regard are already apparent. The very first essential to reform is to discover the need of it, and until this discovery is made and accepted by a sufficient number of the people it is useless to look for improvement. The fact that the former prevailing practice in lighting had numerous and grievous faults is becoming pretty generally known, and as a direct result of this knowledge a demand for better methods is making itself felt.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. George Philler has resigned from the Directorate of the United Gas Improvement Company. His successor is Mr. William Wood.

J. C. Haynes, in his capacity as Mayor of Minneapolis, Minn., has signed the ordinance passed by Councils which commits the city to the construction and operation of a gas works wholly owned and operated as a municipal venture. The ordinance provides that it shall become effective immediately after its publication. Section 2 thereof declares that the rules and regulations for the government and management of the employees in such gas works shall be as hereafter from time to time established and fixed by the City Councils, and Section 3 directs the City Council to issue, as soon as may be necessary for the carrying out of the ordinance, municipal bonds of Minneapolis in a sum or sums not exceeding $2,000,000, "as may be necessary and required for said purpose, under and pursuant to the provisions of Chapter 306, of the General Laws of Minnesota for the year 1907."

"T. O.," writing to us in New York, under date of the 14th inst., says:

To the Editors American Gas Light Journal: In a paper[1] read before the New England Association of Gas Engineers, at the meeting held in Boston last month, by Mr. H. H. Kelly, giving data on distribution at Waltham, Mass., from 1902 to 1907, inclusive, the author calls particular attention to the good, healthy, growth evidenced by the figures presented. The Waltham Gas Light Company supplies electricity as well as gas, but this fact was not stated in the paper by Mr. Kelly. Possibly if no such omission were made the showing would not be so healthy. The percentage of gain in sales, as compared with the percentage of gain in night distribution, seems to show clearly that the lighting business is being neglected, presumably in favor of electric lighting. Where combination companies push electricity for lighting and gas for heating, the effect upon the mind of the public must naturally be to the detriment of gas as an illuminant. The lighting conditions in a dwelling, which were described by Mr. H. Thurston Owens, in *Illuminating Engineer* for December last, were found in a city supplied by a combination company. Mr. W. J. Clark, in the address prepared by him as President for the last meeting of the National Commercial Gas Association, called attention to the fact that gas companies were not paying sufficient attention to the art of illuminating engineering, and the conditions indicated by the figures from the gas department of the Waltham Company certainly back up his statements.

Messrs. James C. Noble, J. S. Laney and James S. Rodgers representing the combination of Kansas City capitalists that are seeking the right to distribute natural gas in St. Louis, Mo., say that, if their petition for a franchise is favorably acted upon, they will have the distribution system completed within 2 years, and that the residents can safely count on a supply equal to 300 million cubic feet per day.

At the annual meeting of the Sheboygan (Wis.) Gas Light Company the officers elected were: President, H. J. Lesher; Vice-President, A. B. Eaton; Secretary, H. J. Lesher; Treasurer, Robert Young.

Mr. V. R. Gerard incloses the following from Louisville, Ky., under date of the 14th inst.: "Early this week Judge Arthur Peter, of the County Court, handed down a decision which declares that the bonds of the Louisville Lighting Company—which concern is controlled by the Louisville Gas Company—are non-taxable, on the ground of their intangibility. Judge Peter held that their valuation had already been taken into consideration in fixing the value of the Gas Company's franchise, which assessing is carried out under the direction of the State Board of Valuation and Assessment."

Mr. Frederick Mayer is back again from a flying trip to Europe, taken something over a month ago. In our article descriptive of the Von Bauer coke oven system, printed in the Journal dated the 9th inst., we omitted to mention that the said system is controlled for America by Mr. Mayer, associated with David B. Carse. The offices of the latter are in No. 12 Broadway, New York city.

Mr. L. V. Christy, Secretary of the Street and Sewer Department, of Wilmington, Del., announces that bids for the public lighting of

1. See Journal, March 9, 1908, page 402.

that city, for a period of 5 years, commencing September 1st, 1908, will not be received after 3 P.M. of the 31st inst. The specifications call for bids on: Not less than 350 electric arc lamps, rated at 9.6 amperes and 47 volts; 428 incandescent electric lamps rating 32-candle power each, or their lighting equivalents; and not less than 600 incandescent gas lamps, of standard pattern. Specifications and all other necessary information can be obtained from Sec'y. Christy.

A PETITION was passed at the last town meeting at Marblehead, Mass., asking the Board of Gas and Electric Light Commissioners to "instruct" the proprietors of the Marblehead Gas and Electric Company to reduce their selling rate to $1.80 per 1,000 cubic feet—the ruling rate is $2.20.

"B. T. M.," writing from Indianapolis, Ind., under date of the 16th inst., says that the competition instituted by the Anderson (Ind.) Gas Company, under the terms of which three money prizes were to be awarded to the ladies who composed the three best letters on the merits of the modern gas range was a success. The tourney certainly aroused much interest, for the Company received scores of letters, all averaging very well in point of merit. The judge appointed was Mr. Philmer Eves, the New Business Manager of the Indianapolis Gas Company, who certainly is well qualified for such a delicate task. He had a larger task then either the Company or the judge bargained for; but he was equal to it, for the three awards were made as follows: First prize, $10, Mrs. T. J. McCullough; second prize, $5, Mrs. Jos. Fenimon; third prize, $2, Mrs. Mary Lail.

MR. HOWARD G. STILLSON has resigned the position of Superintendent of Distribution to the Western United Gas and Electric Company, in order to engage in constructing work, such as plowing, farming and government grading by means of traction engines. His headquarters will be maintained in Aurora, Ills.

A CORRESPONDENT in Holyoke, Mass., writing under date of the 17th inst., says: "That property owners do not entirely relinquish responsibility for the illegal business of tenants who lease the premises was particularly emphasized not long ago in the case of a resort on Main street, in which the devotees of chance in this city of many nationalities were supposed to often congregate. Certain rooms in a block almost within a stone's throw of the Boston and Maine depot were utilized for purposes believed to be not altogether in accord with law-abiding sentiment. Whether or not the property owner knew the uses to which the chambers were being put was beside the case. He ostensibly neglected to observe that cards had prominent place among the groups resorting here. There was a change in tenancy with a gas bill unpaid, and the municipal lighting people, failing to make satisfactory headway with the proprietor of the place, turned its guns on the property owner and the suspicion is that he paid the bill. It is now the general opinion that the resort is no more, and if it were, the chambers would be lighted with candles, for of course the city will not allow its gas and electricity to be used for the promotion of illegal enterprises. The law holds all property owners to strict accountability for losses in gambling resorts if suits are brought to recover, a rule also applying to saloons against which places there are opportunities to recover damages made available under certain conditions."

THE Crawford Gas Company, to operate in Montgomery, Crawford county, Ills., has been incorporated by Messrs. F. G. Deane, R. P. Merrick and J. Palmer McVean, of Grand Rapids, Mich.

MR. CARL H. GRAF, Manager of the Indianapolis (Ind.) Gas Company, has been elected to membership on its Board of Directors.

MR. S. K. CHASE has resigned the position of Auditor to the Beloit (Wis.) Water, Gas and Electric Company, in order to accept a responsible position on the auditing staff of the Peoples Gas Light and Coke Company, of Chicago.

SUPT. LAMSON, of the Chester County (Pa.) Gas Company, has planned out a considerable system of main extensions to and in the southwestern section of its territory in West Chester.

THE Municipal Gas Company, of Albany, N. Y., has determined to discontinue the ruling practice of collecting gas accounts each quarter. The monthly plan will obtain after the first prox.

MR. J. H. CHAMBERS, of Amarillo, Tex., has been appointed Manager of the Atlantic (Ia.) Gas and Fuel Company, the properties of which were purchased a fortnight or more ago by Mr. J. A. McWaid.

MR. EDWARD J. MOORE has been elected a Director of the South Jersey Gas, Electric and Traction Company, vice the late Mr. Thomas J. Barr.

ADVICES recently to hand from Buffalo, N. Y., bring the news of the death of Mr. John McManus, member of the Board of Councilmen of that city, and whose name and work were prominently and actively identified with the gas industry of that city for well over a score of years. His death occurred at his home in Buffalo, the evening of the 11th inst., and it was the sequel of an illness that lasted many months. We are indebted to Mr. V. R. Wade for this account of the career of Mr. McManus: "John McManus was born in Buffalo, Nov. 28th, 1832, and was the descendant of an Irish-American marriage alliance that is registered in the records of Albany, N. Y., in 1795, and in which city his maternal great grandmother was born in 1771. Having acquired a common school education, Mr. McManus (his father was in the government postal service at the time) was appointed to a clerkship in the Buffalo Post Office, which position he retained (meanwhile he had engaged actively in Buffalo politics) until 1861, when he was elected Overseer of the Poor. His course in that position was so commended by the people that they elected him City Assessor, an office that he acceptably filled from 1863 to 1872. In 1876 he was elected Clerk of the Board of Supervisors of Buffalo, and on the expiration of that term of office he engaged in the real estate and insurance business. It was when thus engaged that he became interested in an opposition gas concern—the Citizens Gas Company—the founding of which was afterwards frequently referred to as a 'toucher-up' of the Spaulding, or regular, gas interests of Buffalo. He was (1880) elected the Company's Secretary and Treasurer, and went along with its fortunes until the same became in effect merged with the Buffalo Natural Gas and Fuel Company, of which Company he was Secretary and Treasurer at the time of his death. In 1905 he was elected Councilman. He was prominent in the Volunteer Fire Department, and had for years been prominent in the affairs of the 74th Regiment, in which body he attained rank of lieutenant colonel. He is survived by his widow, two and two daughters. He was buried from the Church of the Immaculate Conception, the morning of the 19th inst."

AT the annual meeting of the Peoria (Ills.) Gas and Electric Company the officers chosen were: Directors, H. D. Walbridge, Walter Barker, F. H. Smith, E. G. Schmidt and Wm. H. Brown; President, H. D. Walbridge; Vice-President, E. G. Schmidt; Secretary and Treasurer, W. H. Brower; Asst. Sec'y and Treas., H. S. Brown.

AN agreement has been reached whereunder the Black Hawk Light, Heat and Power Company is to be purchased by the Vincennes (Ind.) Light and Power Company, and the rate for natural gas will be put at a figure somewhat approaching its real value.

THE United Gas Machinery Company, incorporated under the laws of this State, has opened offices in the Engineering Building, 114–118 Liberty street, New York, and will (in fact, has) taken over the business formerly conducted at 100 Broadway by Mr. Thomas F. Fitzsimmons, whose especial types of gas generators on producer gas account are well and favorably known to the trade. The President and General Manager of the Company is the redoubtable "Tom." himself, and we wish him all possible good luck.

IT is confidently asserted that the Kendalville (Ind.) new artificial gas plant will be ready to send out gas by July 1st. The rate finally agreed upon was $1.20 per 1,000.

THE demonstration test for efficiency of Welsbach or other mantle type of lamps for street illumination, made the first part of this month by the Utah Gas and Coke Company, in Salt Lake City, was a revelation to the Councilmen and to the residents. Here is a paragraph about the exhibition, taken from the Salt Lake City *Tribune*, dated the 10th inst.: "As to the present style of arc lights, where the average is two to the block, there is simply no comparison between the efficiency of the two lights, the gas lighting the street from 50 to 100 per cent. better than the electricity. Then, too, the effect given by the poles is immensely pleasing. So far as the illumination of sidewalks and residences is concerned, in addition to the lighting of the street proper, 7 gas lamps, it is virtually conceded, give a better light than 3 of the present arc lights would give."

The Market for Gas Securities.

There was a fair demand for Consolidated in the week, and the price advanced rapidly from the opening to Wednesday, when the top (about 104) was reached. Yesterday the nominal price was 101½ to 102½, without any sales. To-day (Friday) the opening was at yesterday's closing. The stock is bound for a sharp rise between now and the first prox.

Brooklyn Union continues dull, at par or thereabout. Peoples, of Chicago, even on a narrow range of trading, holds its quotation fairly well, the bid and asking rates being 87¾ to 88. Cincinnati Gas and Electric is 91½ bid, ex-div., and Washington gas registered a gain of 32 points in the selling figure within a fortnight. It is 310 bid, and if the buying therein may be taken as an indication that an important move is underway in its administration, 400 by May 1st need not surprise anyone. A dividend of $1 per share, payable the 1st prox., has been declared by the Providence (R. I.) Company.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

MARCH 23.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	101½	102¾
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	92	97
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual	3,500,000	100	—	170
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	84	86
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	98	104
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	100	105
Con. 5's, due 1945, J. & J.	1,500,000	—	97	101
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	90	98
Standard	5,000,000	100	70	100
Preferred	5,000,000	100	100	125
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	90	100
1st Con. 5's, due 1948, M. & N.	15,000,000	—	91½	92
Yonkers	299,850	500	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	1	1 1-16
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	500,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
" " Bonds, 5's	5,250,000	1,000	63	66
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,000,000	1,000	104	108¼
Cincinnati Gas and Electric Co.	29,500,000	100	61¼	62
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	92	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	87	88
Preferred	3,026,500	100	81	84
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	—	105
Mortgages, 6's	3,600,000	—	—	118
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	—	—	100
Detroit City Gas Co.	6,000,000	50	—	50
" Prior Lien 5's	4,618,000	1,000	—	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Lt. Co., 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	100	105
" Bonds, 5's	10,500,000	—	101	102½
Indianapolis	2,000,000	—	60	70
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	200,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	97	97¼
Preferred	2,500,000	100	92¾	93
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies, of Boston	25,000,000	100	51	—
Preferred	25,000,000	100	82	—
Montreal, Canada	9,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	6,000,000	—	137	138
New Haven	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	87¾	88
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Elec. Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104½	105½
San Francisco, Cal.	15,500,000	—	—	—
St. Joseph Gas Co.—				
1st Mtg. 5's	751,000	1,000	92	—
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgages, 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¼	—
Syracuse, N. Y.	1,375,000	100	50	55
Bonds	2,047,000	1,000	102	—
Washington, D. C.	2,500,000	20	310	325
1st Mortgage, 6's	600,000	—	—	—
Western, Milwaukee	4,000,000	—	—	—
Wilmington, Del.	600,000	50	230	—

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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., N. W. CORNER BROAD AND ARCH STS., PHILADELPHIA, PA., March 11, 1908.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable April 15th, 1908, to stockholders of record at the close of business, March 31, 1908. Checks will be mailed.

1710-5 LEWIS LILLIE, Treasurer.

COMPETENT GAS MANAGER

Desires permanent position with gas company as **MANAGER or SUPERINTENDENT.** Qualified to take entire charge of coal or water gas plant. Fifteen years' experience. Address,

1710-3 "COMPETENT," care this Journal.

Position Wanted

By a Water Gas Maker

With 10 years' experience. A man that can give results. At present employed.

1709-2 Address, "C. J.," care this Journal.

Position Wanted

By thorough, experienced manager of gas, electric or combination property. Experienced in all branches of gas and electric manufacture and distribution work, together with ability in up-to-date new business methods. Experience in rebuilding and construction engineering. Will be open for engagement after April 1. Correspondence solicited. Good references. Address,

1709-4 "J. S. D.," care this Journal.

ENGINEER,

Experienced in the management of gas and electric properties, open for engagement. Understands the manufacture of both water and coal gas. Can give satisfactory references.

1711-3 "GAS ENGINEER," care this Journal.

Superintendent of Construction.

Open for engagement after April 1st, 1908. Supervising central station installations, either gas, electric or general power equipment. Will take charge of the remodeling of old properties. Experienced in all branches of the gas and electric business. Can give references.

1711-3 Address, "ENGINEER," care this Journal.

Position Wanted.

A young married man, who has had nine (9) years practical experience in operation and construction of large and small gas properties, both North and South, would like to get in communication with parties negotiating improvements along these lines. References furnished.

1711-3 Address, "M. C. B.," care this Journal.

A Gas Accountant

DESIRES POSITION.

1711-1 Address, "RICHARD," care this Journal.

Position Wanted.

GASFITTER OR COMPLAINT MAN.

High or low pressure. Capable of taking charge of distribution department. A-1 references. Nine years' experience.

1711-2 Address, "A. T. C.," care this Journal.

Position Wanted.

Man of 30, married, graduate M. I. T., 10 years' experience as gas engineer, all branches, last record as manager 61 per cent. increase of business in two years, references unexcelled, open for position March 1st. Address, "H. G. P.,"

1710-2 Care this Journal.

WANTED,

A Good Solicitor,

Capable of taking care of complaints, as well as solicitations, for gas company in a city of about 20,000. Address, "D. M. E.,"

1711-2 Care this Journal.

WANTED.

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1710-2 "MANUFACTURER," care this Journal.

WANTED, FOR SOUTHERN PLANT,

WATER GAS MAKER

Who thoroughly understands "Lowe" apparatus, reading and setting meters. Permanent position. Give references. Address, "A. E. M.,"

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For few months State experience and salary wanted.

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1710-2 HURON S. D.

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WANTED,

One Good Second-hand 6-inch or 8-inch Gas Exhauster Complete.

Inquire of

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1686-tf RALEIGH, N. C.

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One 7 Feet High Carburetter Water Gas Apparatus with Divided Blast.

Made by Western Gas Construction Co. Used only a short time. For particulars write the

SOLVAY PROCESS COMPANY.

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One No. 4 McKenzie Exhauster for 10-inch connections. Address,

1710-6 TAUNTON GAS LIGHT CO., Taunton, Mass.

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For particulars, address, SEMET-SOLVAY COMPANY,

1711-3m Syracuse, N. Y.

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Gas Engineer's Pocket-book, —BY— HENRY O'CONNOR.
Comprising Tables, Notes and Memoranda relating to the Manufacture, Distribution and Use of Coal Gas, and the Construction of Gas Works. PRICE, $3.50. For Sale by
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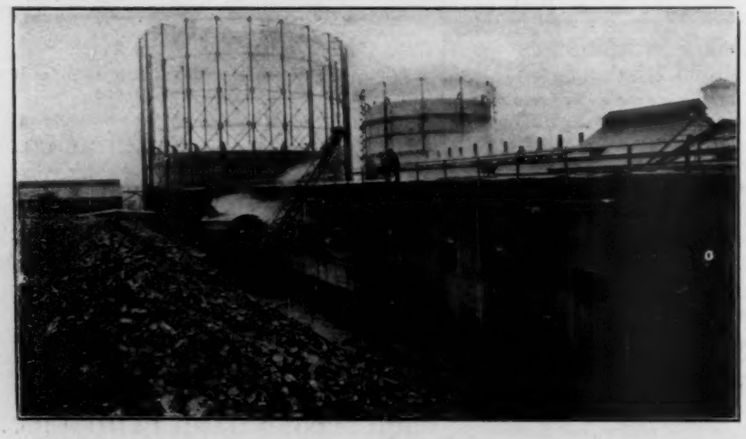

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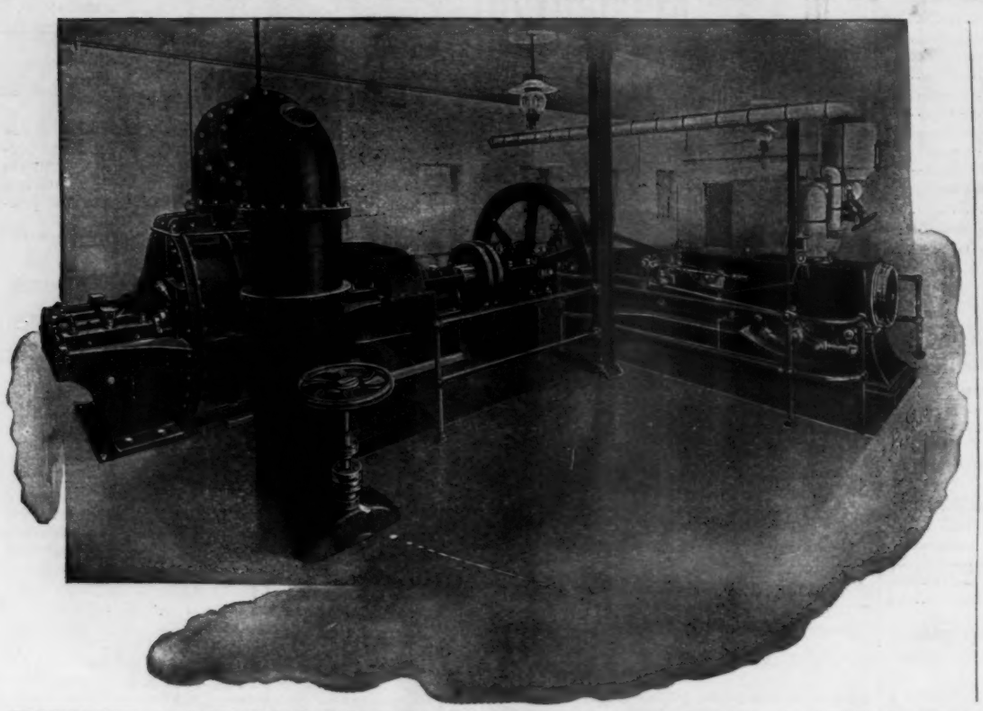
AND HIGH PRESSURE GAS PUMPS.



THIS cut shows one of our High Pressure machines and a 4-valve engine connected by one of our leather link flexible couplings. Two of these units were installed for the Peoples Gas Light and Coke Co., Chicago, at their 73d St. Station. Each machine has a capacity of 14,000,000 cubic feet per day.

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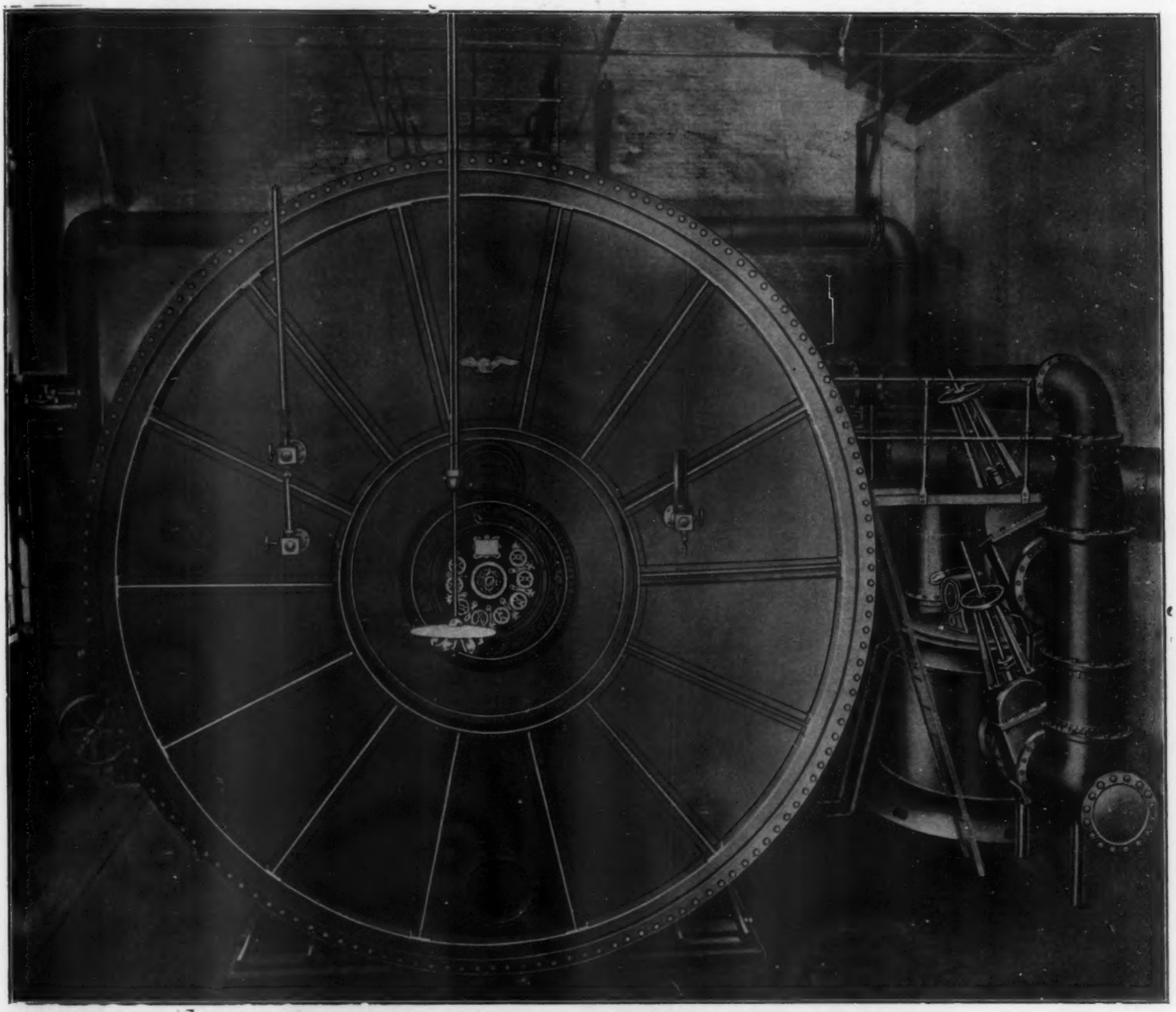

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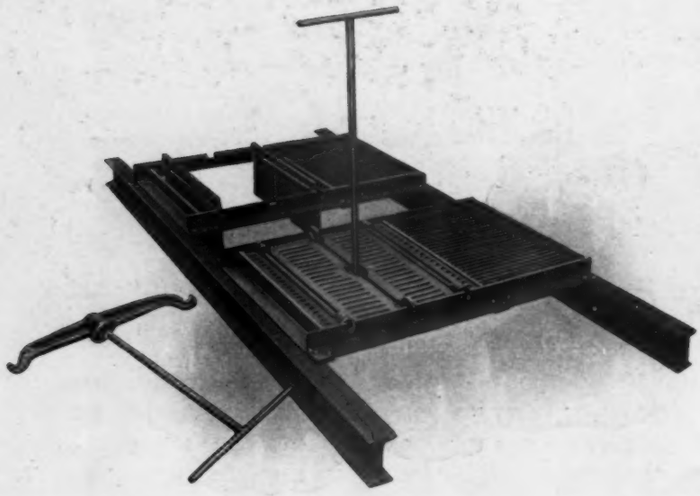

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VERTICAL, INCLINED OR HORIZONTAL RETORTS,

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Plans for modern and up-to-date coal and water gas plants. Modernizing existing plants to cheapen costs of production. Valuation of plants, etc., etc.

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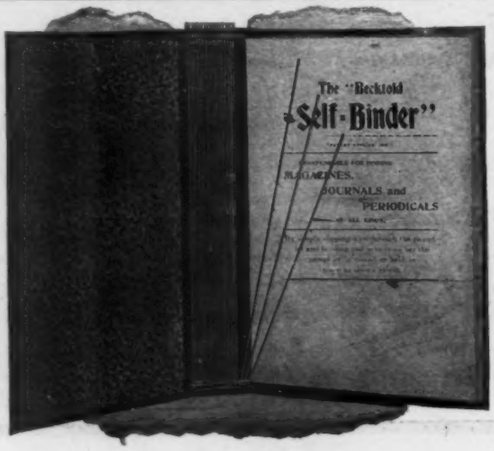

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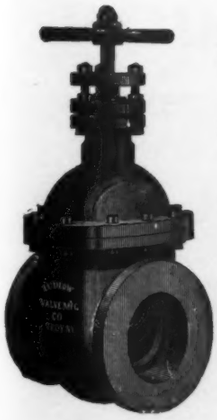

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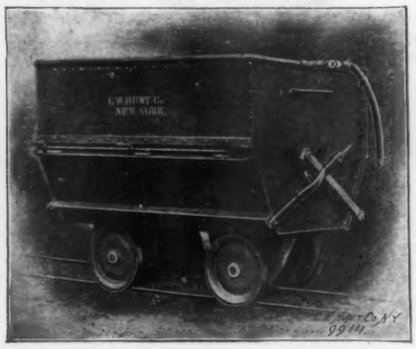

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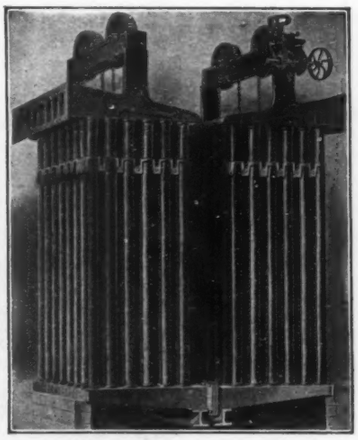
FIELD'S ANALYSIS FOR THE YEAR 1906.

An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland; being the 38th year of publication. Compiled and arranged by JOHN W. FIELD, Sec'y and Gen. Mgr. of The Gas Light and Coke Company, London. Price, $5. For Sale by

A. M. CALLENDER & CO., 42 Pine St., New York City.



HOW MUCH COAL PER 1,000 CU. FT. OF WATER GAS?

If the process of making water gas were theoretically perfect, only 24 lbs. of coal would be consumed per 1,000 cu. ft. of gas generated. As a matter of fact, the actual figures are between 40 and 48 lbs. per 1,000 cu. ft. It is apparent that there is a waste somewhere, and if you will take the trouble to put a thermometer over the stack valve during the "blowing up" period, you will see where the heat goes to. From one third to one half of the heat escapes to the atmosphere, either as sensible heat or latent heat of combustion. If use can be found for this heat a great economy could be effected immediately.

We have found such a use. By means of the Green Air Heater 12 per cent. to 15 per cent. of this heat, or more, can be imparted to the air blown to the generator. This will reduce the time for blowing up and increase the temperature of the generator, so that about the same proportion of coal will be saved.

After the gases have passed through the air heater they are still hot enough to use in a Green Fuel Economizer to heat the boiler feed water up to the evaporative point. In this way a quarter of the boiler coal can be saved. In connection with a 6 ft. generator an investment of $3,500 in an Air Heater and an Economizer will save from $2 300 to $2,500 per year. This ought to repay you for the trouble of writing us for further information. Ask for Circular "AG."

The Green Fuel Economizer Co.,

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New York City, Boston, Chicago, Atlanta, San Francisco, Los Angeles, Seattle, Salt Lake City, Montreal.

Engineers, Builders of Green's Fuel Economizers, Fans, Blowers and Exhausters, Steam Air Heater Coils, Waste Heat Air Heaters, Mechanical Draft, Heating and Ventilating and Drying Apparatus, Draft Dampers and Engines.

12-Inch High Pressure Governor.

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We make all sizes for all classes of reduction,

Double and Single District Stations,

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HOLDER GOVERNORS

And Low Pressure Regulators, all of the Dry Diaphragm type.

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Combination Governor.
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THE LLOYD INTENSIVE SCRUBBER.
DETROIT—MICHIGAN

"The Stationary Rotary."

Greater Capacity in Less Building Space.

Mueller Gas Tapping Machines.

A

Gas tapping machine with a stationary feed screw support is frequently attended by

Great

Inconvenience in use because the immovable support is in the way of free operation of the handle. The MUELLER GAS TAPPING MACHINE has an undeniable

Advantage

In a gooseneck swiveled to the body, which makes it adjustable to any desired position. The gooseneck can always be kept out of the way of the handle, giving the operator the full benefit of the leverage.

MUELLER GAS TAPPING MACHINES are UNCONDITIONALLY GUARANTEED.

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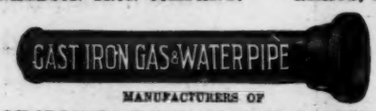

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FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

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COMBINATION RECORDING and INDICATING PYROMETERS

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WATER GAS MACHINES.

Indicator for Operator. Recorder for Superintendent. Adapted for both Carbureter and Superheater.

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They are Very Durable and Can be Depended Upon to Give Satisfactory Service for Years.

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NEW YORK, ST. LOUIS, PHILADELPHIA, SAN FRANCISCO, CHICAGO,

Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

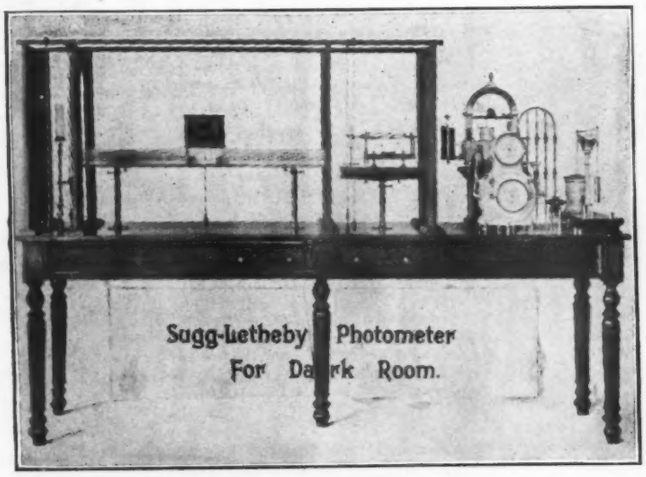
APRIL, 1908.

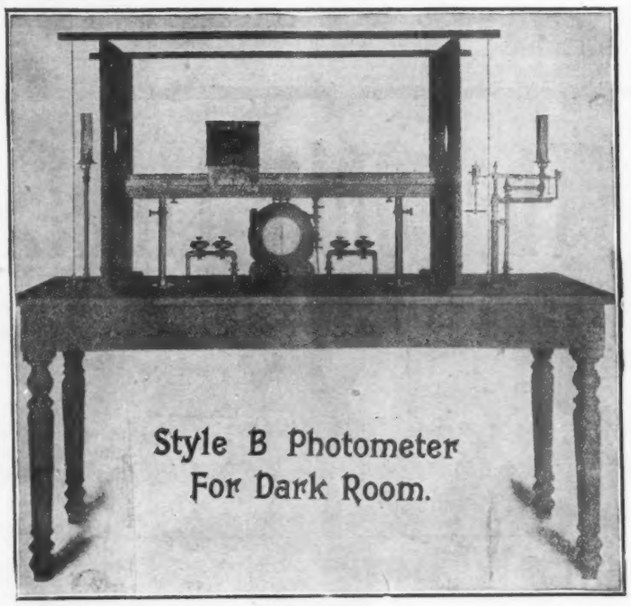
Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.
Wed.	1	6.50 PM	4.40 AM
Thu.	2	6.50	4.40
Fri.	3	6.50	4.40
Sat.	4	6.50	4.40
Sun.	5	10.30	4.30
Mon.	6	11.20	4.30
Tue.	7	12.20 AM	4.30
Wed.	8	1.00 FQ	4.30
Thu.	9	1.40	4.30
Fri.	10	2.20	4.30
Sat.	11	2.50	4.30
Sun.	12	3.20	4.30
Mon.	13	3.50	4.30
Tue.	14	4.10	4.30
Wed.	15	No L.	No L.
Thu.	16	No L FM	No L.
Fri.	17	No L.	No L.
Sat.	18	7.10 PM	10.00 PM
Sun.	19	7.10	11.00
Mon.	20	7.10	12.10 AM
Tue.	21	7.10	1.10
Wed.	22	7.10	2.10
Thu.	23	7.10 LQ	3.00
Fri.	24	7.10	3.40
Sat.	25	7.10	4.00
Sun.	26	7.20	4.00
Mon.	27	7.20	4.00
Tue.	28	7.20	4.00
Wed.	29	7.20	4.00
Thu.	30	7.20 NM	4.00

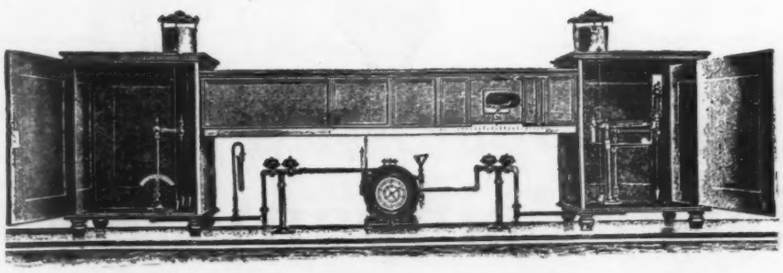
TOTAL HOURS DURING 1908.

By Table No. 1.

	Hrs.Min.
January	228.30
February	187.30
March	192.00
April	160.10
May	155.10
June	138.00
July	155.50
August	173.40
September	185.20
October	214.00
November	218.10
December	226.40
Total, yr.	2235.00







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

APRIL, 1908.

Day of Week.	Table No. 2. New York City. All Night Lighting. Date.	Complete Lighting in One Hour From Time Given P. M.	Complete Extinguishing in 50 Minutes From Time Given A. M.
Wed.	1	5.57	4.47
Thu.	2	6.07	4.37
Fri.	3	6.07	4.37
Sat.	4	6.07	4.37
Sun.	5	6.07	4.37
Mon.	6	6.07	4.32
Tue.	7	6.07	4.32
Wed.	8	6.07	4.32
Thu.	9	6.17	4.22
Fri.	10	6.17	4.22
Sat.	11	6.17	4.22
Sun.	12	6.17	4.22
Mon.	13	6.17	4.22
Tue.	14	6.17	4.22
Wed.	15	6.17	4.22
Thu.	16	6.27	4.17
Fri.	17	6.27	4.17
Sat.	18	6.27	4.17
Sun.	19	6.27	4.12
Mon.	20	6.27	4.12
Tue.	21	6.27	4.12
Wed.	22	6.27	4.12
Thu.	23	6.37	4.02
Fri.	24	6.37	4.02
Sat.	25	6.37	4.02
Sun.	26	6.37	4.02
Mon.	27	6.37	4.02
Tue.	28	6.37	4.02
Wed.	29	6.37	4.02
Thu.	30	6.47	3.52

TOTAL HOURS DURING 1908.

	Hrs.Min.
January	481.50
February	329.15
March	351.50
April	341.50
May	233.05
June	218.10
July	282.55
August	254.55
September	292.25
October	420.45
November	374.30
December	411.05
	3992.35
Deduct on account of 50 min. extinguishing time	30.30
Total, yr.	3962.05

NEW YORK, 318 West 42d Street.
BOSTON, 820 Beacon Building.
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ST. LOUIS, 712 Roe Building.
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....OF AMERICA....

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Controls and Operates the **Welsbach System of Street Lighting,**

Which includes its specially DESIGNED and PATENTED BURNER for PARK LIGHTING exclusively.

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By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

The Chic Light.

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For decorative appearance and large volume of light at a popular price to the consumer,

THE CHIC LIGHT

is practically alone in the field. Complete satisfaction to the user is its strong point.

THE CHIC LIGHT—Design No. 71310.

PRICES:

Boxed complete, with No. 71 Welsbach burner, No 310 F. Q. M. cylinder, No. 196 Junior J Brand Welsbach mantle, including the No. 316 opal shade, which will be packed separately.

Price, complete, clear cylinder, each, dozen lots, ... $1.35
Price, complete, clear cylinder, 100 lots, each, ... 1.25

When supplied with **No. 310 F. Q. M. Opal Cylinder** add 10 cents to above list.

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Package Contains 16 Dozen.

Price, per dozen, ... $4.40
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SOLE AMERICAN BUILDERS

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Nashua, N. H.
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Everett, Mass.
Jenkintown, Pa. (2d contract).
Coney Island, N. Y.
Mexico, Mo.
Jacksonville, Fla.
Syracuse, N. Y. (2d contract).
Atlanta, Ga. (2d contract).
Holyoke, Mass.
Peoria, Ills.
Schenectady, N. Y. (2d contract).
Danbury, Conn.
Galveston, Tex. (2d contract).
Quebec, Canada.
Indianapolis, Ind. (2d contract).
Bessemer, Ala.
Waterbury, Conn. (5th contract).
Sioux Falls, S. D. (3d contract).
Philadelphia, Pa.
New Hartford, Conn.
Poughkeepsie, N.Y. (2d contract).
Nashville, Tenn.
Salisbury, Md.
Norfold, Va. (4th contract).
Wallingford, Conn.
Richmond, Va. (2d contract).
Oak Bluffs, Mass.
Arlington, Mass.

TOTAL SETS INSTALLED DURING YEAR, ... 43
TOTAL SETS INSTALLED TO DECEMBER 31, 1907, ... 677
TOTAL DAILY CAPACITY, TO DECEMBER 31, 1907, ... 545,865,000 cu. ft.

Tar Extractors for Carburetted Water Gas.
Photometrical Apparatus.
Gas Analysis Apparatus.
Recording Gauges.
Straight Standpipe System for Coal Gas Retorts.
Straight Standpipe Cleaners.
Waste Heat Boiler.
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The Gas Engineer's Pocket-Book,

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Manufacturers of all Material for the Construction of Coal Gas Benches.

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INCLINES—We have in SUCCESSFUL OPERATION benches of Inclined Retorts, MANUFACTURED and ERECTED by us.

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We will guarantee "Better Benches," to be easier to control, make more gas per retort, and operate with less fuel than any bench on the market.

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We also Supply the Cheapest and Strongest
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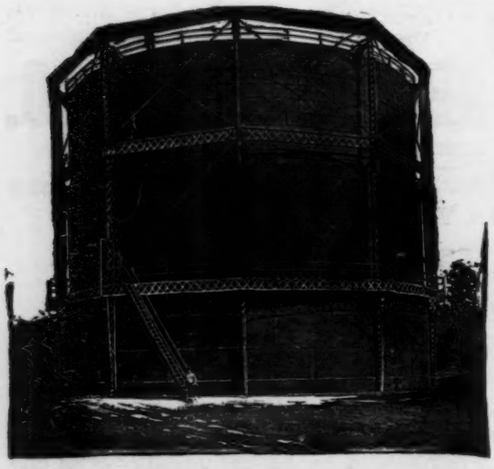

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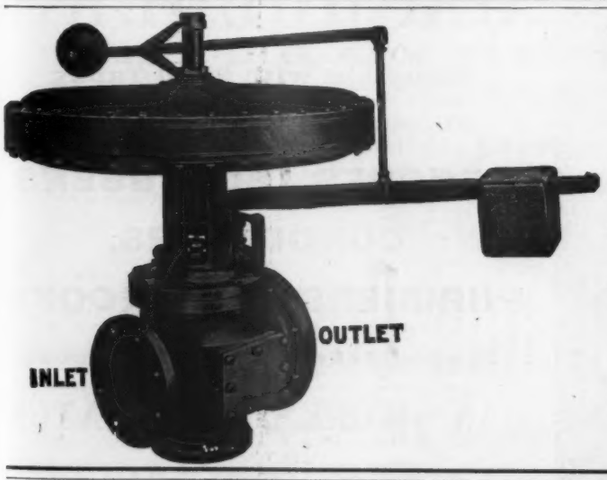

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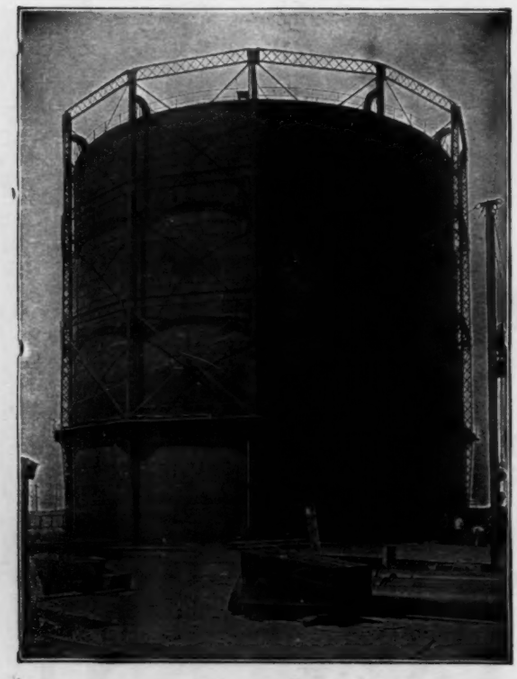

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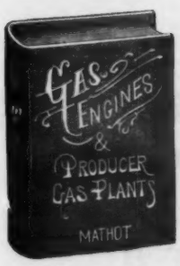

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